

The
Canadian Entomologist

VOLUME XLIII.
1911.

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London, Ontario:
The London Printing and Lithographing Company, Limited.
1911.

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The Canadian Entomologist.



VOL. XLIII.

LONDON, JANUARY, 1911.

No. 1

LEPIDOPTERA TAKEN AT ST. FABIEN, QUE.

BY GUSTAVE CHAGNON, MONTREAL.

A small collection of Lepidoptera was made by the writer during the first five days of July last, at St. Fabien, Rimouski County, Que. Owing to the remoteness of the locality from the better collected districts, it was thought advisable to prepare for publication a list of the captures made.

St. Fabien is situated at about one and a quarter miles from the St. Lawrence River, and is separated from the latter by a narrow wooded hill about 300 feet high. A beautiful sandy road branches off the main public road, passes at the foot of the hill and leads to the beach. This road for nearly its whole length is thickly bordered with alder, birch, coniferous trees, herbaceous plants and flowers of different kinds, and forms an ideal spot for insects, especially for butterflies. This place was visited several times during the above period; unfortunately, the temperature was not always very suitable.

On the second of July an attempt was made to do some collecting at light, but without success, probably due to the coolness of the air. During the earlier part of the evening, before the lantern was set to work, a specimen of *Sthenopsis quadriguttatus* was seen hovering amongst the alder bushes and was captured. Another specimen was seen a few minutes later, but could not be taken.

The afternoon and the night of the following day were spent at Lac des Jones, one of the several lakes in the neighbourhood, and situated about four miles inland of St. Fabien. Some lively trout fishing was done during the greater part of the afternoon, and the evening was spent collecting at light, insects being fairly abundant; unluckily, a heavy rain-storm came down at ten o'clock and lasted until the following morning, when the return to St. Fabien was effected.

The captures were :

Papilio turnus L.—St. Fabien. Several examples were seen; all had a worn-out appearance.

Pontia napi L., var. *oleracea* Harris.—St. Fabien. One specimen.

Eurymus philodice Godart.—St. Fabien. One specimen captured ; saw two or three others.

Argynnis atlantis Edw.—St. Fabien. Common.

Brenthis myrina Cramer.—St. Fabien. One specimen much worn out.

Charidryas nycteis D. & H.—St. Fabien. Six specimens taken in one little spot, not seen elsewhere.

Phyciodes tharos Drury.—St. Fabien. Four specimens.

Basilarchia arthemis Drury.—St. Fabien. One small specimen.

Nomiades couperii Grote.—St. Fabien. This fine Blue was the most abundant butterfly, and could be seen at every minute fluttering along the roadside.

Pamphila palemon Pallas.—St. Fabien. Four specimens taken ; all in bad condition.

Thymelicus mystic Scudder.—St. Fabien. Two specimens.

Thanaos brizo Boisd and Lec.—St. Fabien. One specimen.

Thanaos icelus Lintner.—St. Fabien. One specimen.

Hemaris diffinis Boisd.—St. Fabien. Several.

Sphinx kalmie Smith and Abbot.—Lac des Joncs.

Ceratomia undulosa Walker.—Lac des Joncs.

Smerinthus jamaicensis Drury.—Lac des Joncs.

Alypia langtonii Couper.—St. Fabien.

Apatela dactylina Grote.—Lac des Joncs.

Apatela superans Guenée.—Lac des Joncs. Three specimens taken.

Apatela interrupta Guenée.—Lac des Joncs.

Apatela grisea Walker.—Lac des Joncs. Five specimens were captured.

Apatela innotata Guenée.—Lac des Joncs.

Hadena vultuosa Grote.—Lac des Joncs.

Mamestra assimilis Morr.—Lac des Joncs.

Lomanaltes eductalis Walker.—Lac des Joncs.

Bomolocha scutellaris Grote.—Lac des Joncs.

Melalopha apicalis Walker.—Lac des Joncs.

Datana ministra Drury.—Lac des Joncs.

Heterocampa biundata Walker.—Lac des Joncs.

Schizura leptinoides Grote.—Lac des Joncs.

Cerura occidentalis Lintner.—Lac des Joncs. Several examples were taken.

Habrosyne scripta Grosse.—Lac des Joncs. A good number of these moths were noticed around the camphouse before darkness had completely set in. They had a peculiar flight; they hovered with a slow up and down motion, much like crane flies sometimes do.

Pseudothyatira cymatophoroides Guenée.—Lac des Joncs.

Drepana arcuata Walk.—Lac des Joncs.

Falcaria bilineata Pack.—Lac des Joncs.

I am indebted to Mr. L. W. Swett for the identification of some of the following Geometridæ:

Taliedega montanata Pack.—Lac des Joncs.

Eupithecia russeliata Swett.—Lac des Joncs. Identified by Mr. Swett.

Eupithecia sp.—One specimen at Lac des Joncs. Remarkable for its long pointed fore wings.

Venusia cambrica Curtis.—Lac des Joncs. Four specimens. Identified by Mr. Swett.

Euchæca albovittata Guenée.—St. Fabien.

Rheumaptera hastata Lin.—St. Fabien. Very numerous along the roadside.

Petrophora ferrugata Clerck.—Lac des Joncs.

Petrophora fluctuata Lin.—Lac des Joncs.

Eufidonia notataria Walk.—Lac des Joncs.

Cymatophora brunneata Thunberg.—St. Fabien. Identified by Mr. Swett.

Cleora indicataria Walk.—Lac des Joncs.

Euchlæna effectaria Walk.—Lac des Joncs.

Metanema inatomaria Guenée. Lac des Joncs.

Azelina ancetaria Hübner.—Lac des Joncs.

Callizzia amorata Pack.—Lac des Joncs.

Evergestis straminealis Hübner.—St. Fabien.

Phlyctania tertialis Guenée.—Lac des Joncs.

Pyrausta funebris Ström.—St. Fabien.

Pyrausta ochosalis Dyar.—St. Fabien.

Crambus hortuellus Hübner.—St. Fabien.

Crambus sp.—St. Fabien.

Olethreutes bipartitana Clemens.—St. Fabien.

Archips persicana Fitch.—St. Fabien.

Phalonia vitellinana Zeller.—St. Fabien.

Sthenopsis quadriguttatus Grote.—St. Fabien.

ON THE GALL-MAKING MOTHS ON SOLIDAGO AND ASTER,
WITH DESCRIPTION OF TWO NEW SPECIES.

BY AUGUST BUSCK, WASHINGTON, D. C.

Gnorimoschema salinaris, n. sp.

Labial palpi typical in shape, whitish, liberally sprinkled with black and gray, without any black annulation just before the apex, such as found in the closely-allied *G. gallsolidaginis*, or at most with but a faint trace thereof. Face, head and thorax bluish-white, suffused with fuscous and brown scales. Fore wings elongate, pointed, narrower than in *gallsolidaginis*; coloration and pattern very similar to this species, with the rather sharply-defined basal light area extending along the dorsum and spreading out over the apical third of the wing, and with the large costal chocolate-coloured area as in this species, but with ill defined blackish markings on the dorsal edge near base, and with irregular, longitudinal blackish markings in the interior and apical part of the dark costal area, not found in *gallsolidaginis*. Cilia whitish, heavily daubed with black and brown. Hind wings light, ochreous-fuscous; cilia yellowish. Abdomen light fuscous, with the basal joints velvety-yellow above. Legs whitish, strongly suffused with black and brown; tarsal joints with rather well-defined light ochreous annulations at the tip.

Alar expanse: 20-24 mm.

Habitat: Boston, Mass. Miss Cora H. Clarke, coll.

Food-plant: *Solidago sempervirens* Linn.

U. S. Nat. Mus., type No. 13441.

This species makes very similar galls on the stalks of the salt marsh Golden-rod as *G. gallsolidaginis* makes on the upland dry species.

The adults are also very similar, and the present species has for several years been placed tentatively under Riley's name in the National Museum, partly because it was represented only by single or unbred specimens, and partly because Riley's species was supposed to be very variable. As a matter of fact, however, the true *gallsolidaginis* is rather constant in its colour and ornamentation, as indicated by a large series, bred during several years by the writer in the neighbourhood of Washington and of St. Louis, Mo., the original locality of Riley's types in the National Museum.

These specimens are all of the characteristic soft chocolate-colour, with the ornamentation produced solely by white dusting on the basal, dorsal and apical parts; they all have broader wings than *salinaris*; in *gallsolidaginis* the costa is more strongly arched, and the cilia gives a

rounded appearance to the apex, which *salinaris* has more straight and pointed wings.

The lack of a well-defined black annulation before the apex of the labial palpi and the presence of the black, longitudinal markings on the fore wings are the most dependable characteristics of *salinaris* in differentiating it from *gall-solidaginis* Riley.

The moths issued from September 1-7th.

Gnorimoschema subterranea, n. sp.

Labial palpi typical in form; pepper-and-salt-coloured. Antennæ with each joint black, brown and white in succession. Face and head whitish, suffused with brown and fuscous. Thorax brown, sprinkled with white. Fore wings rich reddish-brown, in some specimens chocolate, with a more or less irregular sprinkling of black and white atoms. Cilia whitish, sprinkled with brown. Hind wings yellowish-fuscous; cilia gray. Abdomen dark fuscous, with the three basal joints velvety ochreous above. Legs blackish-brown, sparsely sprinkled with white; tarsal joints with narrow white annulations.

Alar expanse: 12-20 mm., average 17 mm.

Habitat: Boston, Mass. Miss Cora H. Clarke, coll.

Food-plant: *Aster multiflorus* Aiton.

U. S. Nat. Mus., type No. 13386.

This species comes between *G. gall-solidaginis* Riley and *G. Buskiella* Kearfott, both in size and ornamentation; it differs from the former in the absence of any trace of a lighter dorsal basal area on the fore wing, though in some specimens there is a faint approach to the other wing-pattern of this species. *G. Buskiella*, which also feeds on *Aster*, but which makes its gall on the upper branches of the plant, differs from the present species in its darker colour and the even sprinkling all over the wing of white scales. The galls of the present species are found just underground, or with their upper part just above ground, on the root-stocks of *Aster multiflorus*, with rootlets emitted from their lower end, and the annual shoot from their upper end. They are more or less spindle-shaped, about 15 mm. long by 6-8 mm. in diameter; woody, rather thick-shelled, the pupa filling nearly the entire cavity. The adult issues from a round hole previously prepared by the larva, but not plugged, as in the *Solidago* gall, merely covered by the outer skin, which is left unbroken by the larva.

Several galls (2-10) are often found together in a cluster on the same rootstalk.

Miss Clarke states that the galls are rather abundant, but not easily observed on account of their location, the more so as the *Asters* normally grow in the grass-sod, where it is not easy to dig.

Miss Clarke sent me a few of these galls in August; I asked her to get more, and, with her usual enthusiasm, Miss Clarke made a special trip to Boston from her summer residence and secured about 150 additional galls, which, during the first two weeks in September, produced a large perfect series.

Gnorimoschema gallæasteriella Kellicott.

In Vol. XLI, p. 75, 1909, of THE CANADIAN ENTOMOLOGIST, the late Dr. Wm. Brodie, of Toronto, maintains that this name is a misnomer (he has it wrongly as *asterella* Kellicott), and that Kellicott was mistaken in his identification of the food-plant. Dr. Brodie even asserts that he can recognize Kellicott's woodcut of the gall as *Solidago latifolia*, not as *Aster corymbosus*.

In this I cannot agree with Dr. Brodie; Kellicott's figure may at least as well represent *Aster* as *Solidago*, and there is no reason to doubt that Kellicott did breed his species from *Aster*, as it has been bred repeatedly since from that plant. I have before me specimens from Miss Clarke, which were unquestionably bred from the white wood-aster, *Aster divaricatus* Liss. (*corymbosus* Ait.), near Boston.

On the other hand, I have many perfect specimens bred by Dr. Brodie and by Mr. A. Cosens, of Toronto, which, according to both these gentlemen, were bred from *Solidago latifolia* and *S. caesia*, and the species would thus seem to infest both *Aster* and *Solidago*.

ON THE GENUS MASTOR, GODMAN AND SALVIN.

BY KARL R. COOLIDGE, PASADENA, CALIFORNIA.

Godman and Salvin, in the *Biologica Centrali-Americana*, Rhopalocera, Vol. 2, p. 567, 1893, erected the genus *Mastor* for the reception of three species, *Pamphila* (*Hesperia*) *bellus* Edwards, and two new species, *M. perigenes* and *M. anubis*, the latter being named as the generic type. *Mastor* is characterized as having the primaries fairly short, truncated somewhat apically, in this respect approaching *Poanes* and *Poanopsis*, from which it differs in a longer crook to the antennæ, the club slenderer, and the primaries less rounded at the tip. The third joint of the palpi is short

and bluntly conical. The primaries have the costa arched basally; the cell nearly two-thirds the length of the costa; the discocellulars strongly oblique, the upper one twice the length of the lower, and the latter somewhat shorter than the third median segment; lower radial depressed basally; first branch arising slightly beyond middle of median nervure, and the second shortly before lower cell angle. Secondaries slightly lobed at anal angle; the discocellulars weak. Body rather slender. Middle tibiæ conspicuously spined; hind tibiæ with two pairs of spurs. A narrow oblique band on primaries of males, extending from base of second median branch to the middle of the submedian nervure.

In addition to the three species above mentioned, *Pamphila phylace* Edwards (Field and Forest, Vol. 3, p. 117, 1877) falls in this genus. Dyar, in his "Review of the Hesperidæ of the United States," Journ. N. Y. Ent. Soc., Vol. XIII, p. 133, 1905, gives the following synopsis of the genus *Mastor*:

Head and collar golden, fringes sordid pale.....*phylace*.
Head, collar and fringes golden.....*bellus*.

Mastor phylace Edwards.—Originally described from Colorado, and has since been recorded from Arizona and New Mexico. Little seems to be known of it.

Mastor bellus Edwards.—Published in Papilio, Vol. 4, p. 57, 1884, from specimens taken by Morrison in Southern Arizona. Dr. Barnes, Ent. News, Vol. XI, p. 331, 1900, writes that "A number of specimens of this species taken this year in the Huachuca Mountains, are, I believe, the first taken since Morrison got the types many years ago." Godman and Salvin, however (1893), reported it from Las Vigas and Milpas, in Durango, Mexico.

During the past season I found *bellus* one of the most abundant species of butterflies occurring in the Huachuca Mountains, of Cochise County, Arizona. My first specimen was taken on May 25. From May 27 on it appeared more and more commonly until about the middle of July, when it gradually disappeared. It is two-brooded, the second normally appearing towards the last of July. *Bellus* does not appear to be restricted by elevation, as I took examples at less than 5,000 and at over 8,000 feet. June 21, at 7,800 feet, I observed a female ovipositing, and secured three eggs. They were laid on the ventral surface of blades

of grass, singly. Colour, a pale creamish-white, assuming a darker tinting as the young embryo develops; hemispherical, rather low, the base broadly flattened. The egg appeared to be marked with vertical ridges, but I could not make sure of this with a low-power glass. Just before the emergence of the young larva the egg is opaque, the black head of the larva being plainly visible. One egg hatched July 3, another July 8, and the third July 9. The young larva at once attacks the egg, devouring all but the basal portion.

Young larva.—Length, about 1 mm.; body cylindrical, slender, tapering from the middle quite rapidly posteriorly, and less so anteriorly; head jet black, large, subglobular, about one-third larger than middle of body; neck tightly strangulated; colour of body pale yellowish-white, sparsely covered with rather long concolorous hairs; legs and prolegs same colour; a greenish tint is assumed as the larva begins to feed. The first moult takes place in from three to five days.

After first moult.—Length, about 2.5 mm; head as before, but now only slightly larger in breadth than body; body as before, but the colour a rather dark grassy green, the three posterior segments with a somewhat yellowish tinge; legs and prolegs greenish-yellow. The larva forms a nest at the apex of the blade, drawing the edges together by fine white strands, the distance of the tube thus formed varying according to the age of the larva. The larva appears to be able to walk as readily backwards as forwards. Although I found many eggs and larvæ, I did not succeed in bringing the latter past the second instar.

Mr. Victor L. Clemence has given me several examples of the second brood of *bellus*, taken July 18 and 26, in the Chiricahua Mountains, Cochise County, Arizona. These have the fringes of a pale, dirty, creamish colour, answering perfectly to the description of *phylace* Edwards. It is thus obvious that *bellus* is the first brood and *phylace* the second, the latter having seven years' priority. But as representatives of the two broods are so strikingly distinguishable, it is appropriate that the first brood can be termed form *bellus* and the second *Mastor phylace*. *M. anubis* Godman and Salvin, described from Orizaba, Jalapa and Omilteme, in Guerrero, Mexico, is very probably a synonym of *phylace*, but as I only know it from the very brief original description, I cannot be definitely sure of this. *Mnaseas (Thymelicus) bicolor* Mabille, from Mexico and Central America, may be another species that will have to be referred to the synonymy of *phylace*.

NOTES ON DIABROTICA AND DESCRIPTIONS OF NEW SPECIES.

BY FRED. C. BOWDITCH, BROOKLINE, MASS.

During the last two summers I have made the following notes on Mr. Baly's paper. (Baly's Sec. 1 Trans. Ent. Soc., 1890.)

Among the species labelled *Lacordairei* Kirsch, in the 1st Jacoby collection I separate three examples as the true *fraterna* Baly, described from Guatemala; the form is long, narrow and parallel, and in the ♂ the fourth joint of the antennæ is as long as the first three joints; some of the forms classed by Jacoby as *Lacordairei*, especially those collected by Champion, have a black anal segment, which would seem to throw them out of this species. Mr. Baly, p. 7, speaks of the entirely black legs of *Lacordairei*; the Central American forms in the Jacoby collection have base of femora pallid.

Sanguinicollis Jac., Cist. Ent., II, p. 524, the type of which is in my collection, I place near *rugulipennis* Baly.

On page 25 Mr. Baly, speaking of *atomaria* Jac., says "the antennæ nearly equal to the body in length." Mr. Jacoby, in his description, P. Z. S., 1889, p. 284, says "the antennæ about half the length of the body." My example from the Jacoby collection has the antennæ missing, another specimen from Venez (Caracas?) seems to be a ♀, the antennæ are half as long as the body.

D. pauperata Baly, p. 27. The typical form has two discoidal black spots, the first about the middle and the other about 1.5 mm. behind. Specimens occur where the two spots are joined, forming a short discoidal stripe, this form also having the humeral vitta whole, thus producing a form resembling *atrilineata* Baly and its allies; other specimens have the discoidal spots entirely absent; in both these last forms the sutural spot is only a piceous line; all the 16 examples in my collection come from Bahia, Brazil, which is the typical locality for the species.

On page 38 *D. fulvofasciata* Jac. is given by Baly as a synonym of *tumidiconnis* Er., the description of the former given by Jac., P. Z. S., 1889, p. 281, speaking of the ♂ antennæ, "the second and third joints very short and equal, the fifth to the ninth joints greatly dilated and thickened," and the habitat Caracas. Baly, on pages 38-39, speaking of *tumidiconnis* Er., says of the ♂ antennæ, "the 2nd joint very short, the 3rd nearly one-half longer, the 4th longer than the preceding two united,

the 7th and following two joints in the ♂ thickened," and the habitat Peru and Bolivia.

The differences given in the above descriptions are even more noticeable in the specimens themselves; the two forms are plainly distinct, and should not be united. I have one ♂ of each form from the type localities.

D. tibialis Baly, p. 79. This name being previously used by Jacoby in the *Biologia*, p. 512, should be changed to *confusus*.

D. variolosa Jac. (type in my collection) comes near *marginata* Sturm.

In identifying species of this genus, it should be borne in mind that the antennæ of the ♂'s are usually the longer, and the third joint in the ♂ is relatively shorter than the same joint in the ♀. The foveation of the thorax seems to me, in some instances at least, to be possibly a matter of sex. This, however, is more a suggestion for future research than a definite opinion.

The specimens sent me by Messrs. Staudinger and Bang-Haas as cotypes of *D. angustofasciata* Jac. in litt., belong to *Luperodes*.

D. suffusa Baly is not mentioned in Mr. Baly's paper. If it has been sunk as a synonym I have overlooked it. The Jacoby collection had it marked as a distinct species. I place it near *rugulipennis* Baly.

D. hahneli, nov. sp.

Black, base, and joints nine and ten of antennæ, thorax, femora and middle of first three abdominal segments yellow, elytra almost smooth, slightly plicate, with four white spots on each side placed 2-1-1. Length 7 mm.

Type collected by Dr. Hahnel, Amazons (Staudinger).

Form stout, head black, clypeal ridge not well defined, antennæ stout, more than half the length of the body, joint 2 short, 3 barely one-half longer, 4 much longer than the two preceding united, joints 1-3 flavous, tinged with piceous above, 9-10 and base of 11 flavous, thorax flavous, convex, shining, broader than long, a few fine punctures at the sides, lightly trifoveate, scutellum dark piceous, elytra shining black, very finely punctate, a round white spot back of the base, near the suture, a smaller one near the margin back of the shoulder, a small transverse spot back of the middle and a round spot at the apex, equidistant from the margin and suture; the inflexed edge of the elytra, behind the shoulder, is faintly piceous, body beneath black, excepting the thorax, the anterior breast and

middle of the first three segments of the abdomen, which are yellow (the black edge of these segments is about $1\frac{1}{2}$ mm. wide), legs with tibiae and tarsi black, coxae and femora yellow, with apex of the hind pair piceous. The form is very slightly dilated at the rear. The type specimen has the plication of the elytra slight but well marked. In addition to this specimen I separate another example marked by Jacoby as *Lacordairei*, labelled "Amaz.," which seems to be a ♂, and has the joints 2-3 of the antennae equal and the plication very slight; the colouring and form, however, are precisely similar. Should be placed in § A, Baly's paper; the coloration of the abdomen easily distinguishes it.

D. sancatarina, nov. sp.

Head black, antennae dark, with three basal and three upper joints flavous, thorax yellow, smooth, shining, elytra not plicate, black, tinged with greenish, shining, punctured, with the lateral margin, extreme apex excepted, and basal and apical round spots and median transverse spot flavous, below yellow, with pectus, tibiae and tarsi black. Length $6\frac{1}{2}$ mm.

Four examples from St. Catharina, Brazil (Mr. Klages).

♂ antennae three-fourths as long as body, joints 2-3 short, equal, 4 almost twice as long as both combined; shorter in ♀, with the joint 3 one-half longer than 2, and 4 not twice as long as both combined, three upper and three lower joints flavous, the tip of the last piceous, thorax one-half broader than long, convex, shining, impunctate on the disk, scutellum dark piceous, elytra shining, evenly and strongly punctured, slightly depressed along the suture at base, the epipleurae and inflexed margin yellow, the flavous colour vanishing when it reaches a point just behind the apical spot, which is round and equidistant from the suture and margin, the basal spot is round, discal and near the suture, the transverse spot is behind the middle and oblique, not attaining either the side or suture; one of my specimens has the elytra very obsoletely subplicate; belongs in § A, Baly.

D. funerea, nov. sp. (Jac. in litt.).

Piceous brown, with dark piceous, almost black head, elytra not plicate, each side with two round basal, one transverse submedian and one round apical white spots, antennae with joints 9-10 white, femora yellow, tibiae and tarsi colour of head. Length 5-6 mm.

Seven examples, all labelled Surinam, and deep orange-colour label.

Antennæ more than half the length of the body, joints 2-3 short, the latter slightly the longer, 4 equal to, or longer than the preceding two united, according to sex, colour light piceous, growing darker and becoming black on joints 7-8, eleventh white at base, black at tip, sometimes the tenth is piceous at the upper half; thorax about as broad as long, sides nearly parallel behind, smooth, convex, shining, piceous, a few fine punctures at the sides and obsolete traces of two foveæ, elytra piceous, shining, slightly dilated at the rear, finely and sparsely punctured, each with four flavous or white spots, the first round sub-basal near the suture, the second round sub-humeral near the margin, the third elongate sub-median, transverse not attaining either suture or margin, the fourth round, apical, equidistant from the suture and margin; all below piceous, with the femora and abdomen flavous.

The species has been distributed with the manuscript name of *funerea* Jac.; three of my specimens were sent me as cotypes by Messrs. Staudinger and Bang-Haas. I have preserved this and some following names to save confusion. Sec. A, Baly.

D. fuscus, nov. sp.

Head black, antennæ piceous, joints 1-3 flavous, then gradually becoming piceous, 9-10 white; thorax yellow, transverse, disk smooth, convex, shining, faintly bifoveate, scutel black; elytra plicate, black, thickly and evenly punctate, the lateral margin narrowly (extreme apex excepted), a round apical spot and an oblong submedian lateral spot yellowish-white, also from the middle of the base of each elytron to a point beyond the middle an ill-defined long yellowish-white mark not attaining the suture, body beneath yellow, breast black, legs yellow, tibiæ and tarsi faintly piceous.

Four examples, Peru, green label (Callanga?). Length 6 mm.

Apparently a variable species, the form above described is a ♂, of which I have two examples practically alike, the other two are ♀'s, and have the flavous colour of the elytra diffused over the whole surface, leaving the suture narrowly dark and a humeral sublateral line of black, extending around the curve of the convexity and showing the two yellow spots above described, indicated by dark rings; other forms doubtless occur. The sides of the thorax are strongly sinuate and reflexed behind, the elytra are moderately dilated behind, especially in the ♀; the punctuation is coarse, thick, and in some places confluent. I place it near

decaspila Baly. The elytral pattern is almost exactly duplicated in some of the varieties of *IO guttata* Oliv., but the antennal joints at once differentiate it.

D. uncinata, nov. sp. (Jac. in litt.).

Head black, antennæ dark piceous, last three joints flavous, thorax rufous, shining, impunctate, except the sides, broadly depressed and lightly trifoveate, scutel black, elytra black, tinged with cyaneous, obsoletely plicate, strongly dilated posteriorly, shining, punctate, with lateral margin dilated at the apex, a narrow curved fascia behind the middle, and suture narrowly from the fascia to the apex flavous, below black, with abdomen and bases of femora yellow. Length 6-7½ mm.

Three examples, Marcapata, Peru.

Antennæ three-fourths as long as the body, joint 3 one-half longer than 2, which is short, 4 longer than the preceding two united, four or five lower joints light piceous, the last three, apex of the eleventh excepted, flavous; thorax about as long as broad, sides very lightly sinuate, finely punctured at the sides, broadly depressed (one example very lightly) behind; the side foveæ small, but distinct, the third subobsolete, placed just before the scutel, which is dark piceous; the elytra differ in colour in each of the examples before me, black, black tinged with green, dark steel-blue; all, however, have the margin, apex and fascia and one the sutural border flavous, as above described; the form is broadly dilated at the rear, slightly depressed behind the scutel, surface evenly and moderately punctured, with a tendency to be semisulcate longitudinally, especially near the apex.

The species has been distributed with the manuscript name *uncinata* Jac. Two of my specimens were sent me as co-types by Messrs. Staudinger and Bang-Haas; one of them seems as if it might be a different species (*angustofasciata* Jac. in litt.?), as the fascia is almost transverse in place of being curved, and the thoracic depression is wanting; what I take as the type is the other example, having black elytra, a narrow curved fascia and depressed thorax, the longitudinal ridges of the elytra showing at the sides and rear, and the femora very slightly flavous at the base.

D. semiviridis, nov. sp. (Jac. in litt.).

Head, antennæ, legs and breast black, thorax greenish, flavous, convex, shining, very lightly foveate and punctate, elytra not plicate, prasinous, with a dash of orange, coarsely, confluent punctate, with a

humeral, and a common triangular, elongate sutural, and two or three small spots triangularly placed at the middle of each elytra black. Length 5-5½ mm.

Six examples, Marcapata, Peru, and also Bolivia (Mapiri?).

Resembles some of the forms of *IO-punctata* Latr.; antennæ about three-fourths the length of the body, wholly black, joints 2-3 short and about equal in ♂, 3 a little longer in ♀, 4 longer than the preceding two united, noticeably so in ♂, thorax about as long as wide, convex, shining, sparsely, finely punctulate, very sparingly on the disk, two small foveæ faintly indicated, one on either side of the middle, sides nearly straight; scutel black; elytra slightly dilated at the rear, and depressed back of the scutel, punctuation finer behind; the elytra show a suffused orange-colour, which seems normally to be a cloudy vitta from the shoulder to the apex; in some examples it is almost wanting, and in others the orange tint suffuses nearly the whole elytra. The humeral spot is round, the sutural, elongate triangular, about 1 mm. long; there is a small round spot on the disk just before the middle, another between the last and the margin, but a little to the rear, and a third on the disk, in line with the first but about the beginning of the convexity, in some examples there are indications of a fourth spot between the last and the margin, and in others the third spot is absent; probably examples occur in which some or all the other elytral spots disappear; body beneath and legs black, except the abdomen and thorax are yellow.

The species has been distributed with the manuscript name of *semiviridis* Jac. Three of my specimens were sent me as cotypes by Messrs. Staudinger and Bang-Haas; the typical form I regard as the one with the three discal spots; distinguished from *IO-punctata* Latr. by the coarse punctuation of the elytra, the thorax also seems to have the sides less sinuate.

D. piceopunctata, nov. sp.

Head, breast and scutel black, antennæ flavous, fuscous in middle and at end, thorax yellow, convex, finely punctate, elytra obsoletely plicate, bright yellow-prasinous, shining, with common sutural triangular spot, a humeral, two lateral, and a small, submedian discoidal spot, rufous piceous; body below yellow, legs yellow, with tarsi and outside of tibiæ faint piceous. Length 5½ mm.

One example, San Augustin, Mapiri (M. Stuart).

Head with a sharp, round frontal fovea, antennæ about half the length of the body; joint 2 short, chubby; 3 one-half longer, more cylindrical; 4 as long as preceding two, 1-3 and base of 4 yellow, then dark piceous to the 9th, then flavous to the piceous upper half of the 11th, thorax broader than long, sides strongly sinuate, disk very obsoletely trifoveate, elytra scarcely dilated to the rear; punctures close and even, somewhat dulling the shiny appearance, the sutural spot is broad and abruptly attenuated to the rear, where it is drawn out as a thread-like line on the edge of the suture, gradually fading away about the middle, humeral spot, joining the sutural at the extreme base; the 1st lateral spot is large and round at the median side, and the 3rd lateral spot is on a line with the discal, and probably at times connected with it. The general effect is bright yellowish-green, with three basal and two lateral and a small hind spot rufous piceous. I place it next *atomaria* Jac.

D. neoatromaculata, nov. sp.

Head and breast black, antennæ fuscous, thorax rufous, convex, shining, very finely and sparsely punctulate, elytra slightly plicate, dull orange, with a common triangular sutural spot, a broad humeral sublateral stripe extending to the middle and just before its end, extending inward toward the suture, and a curved fascia between the apex and middle, concave behind and not reaching either the margin or suture, all cyaneous blue, beneath and legs yellow, tibiæ and tarsi dusky brown. Length 5 mm.

One example, Rio Mixiollo, Prov. Huallaga, Peru (G. A. Baer, Aug. 8, 1900). Shape, size and general appearance of *atromaculata* Baly, but with black tarsi and tibiæ.

Head with well-marked frontal fovæ, antennæ $\frac{3}{4}$ length of body, joints 2-3 short, about equal (δ ?), 4 longer than both together; 5, 8 and 11 are darker fuscous; thorax longer than broad, lightly sinuate behind, the two ordinary foveæ are visible only at certain angles as minute depressions, punctuation of elytra moderately thick and even at the base and middle, becoming sparse towards the apex, the cyaneous markings have the appearance of being impressed, so that the yellow central parts seem slightly raised; the tibia and tarsi are about the colour of the darkest part of the antennæ.

The elytral markings are almost exactly those of *atromaculata* Baly, the colour of which is given in the description as black, but an example in my collection (ex Baly) has the markings blue-black, but the dark tibia and tarsi will at once separate the two.

D. bioculata, nov. sp.

Head, pectus, tibiæ and tarsi black, antennæ dark, lighter at base and apex, thorax yellow, with a few fine punctures, scutel yellow, elytra pale flavous, plicate, each elytron with two blue-black or cyaneous rings, one basal touching the suture and not the side, the other apical and not attaining either the sutural or margin. Length, 6-6.5 mm.

Type from Jalapa, four specimens Vera Cruz; Mex. two examples.

Similar in appearance to *biannularis* Har., but with black tibiæ and tarsi. Antennæ more than half the length of the body, with joint 2 short, 3 not half longer, 4 equal the two preceding, colour dark fuscous, the first three or four joints pale, also 10-11, excepting the apex of the last; thorax broader than long, more or less depressed and bifoveate, sides plainly sinuate behind; scutel yellow or piceous; elytra pale yellow, moderately and finely punctured, each with two blue or cyaneous rings which enclose a round yellow spot, femora yellow. This species has heretofore been confounded with *tibialis* Jac., and *biannularis* Har.; from the former it differs by the colour, size and sculpture of the thorax, and from the latter by the black tibiæ and tarsi; two of my Jalapa examples were in the first Jacoby collection as *biannularis* Har., and were collected by Hoege. They were gummed on cards, so the legs were not readily visible. Two others from the same locality among the Tring material and two from Vera Cruz, collected by Townsend.

(To be continued.)

OBITUARY.

We regret to record the death of Mr. Otto Seifert, who was stricken with cerebral apoplexy on Oct. 18, 1910, while planting flowers in his garden, and died two days later at his home, 230 West 2nd St., Mt. Vernon, N. Y.

Mr. Seifert was born in Hildesheim, Germany, on Feb. 26, 1848, and studied at the Goettingen University. He came to America in 1871, and for a number of years was engaged in the practice of pharmacy. From his earliest childhood he was a lover of nature, and later an enthusiastic entomologist, devoting all his leisure time to the study of Lepidoptera, the North American Arctiidæ being his special favourites. He published several articles in various entomological journals, and was for many years a subscriber to the CANADIAN ENTOMOLOGIST.

He was a man whom all men loved and honoured, and his death is a great loss to his family and his many friends.

NOTES ON THE LIFE-HISTORY OF TWO SPECIES OF
CAPSIDÆ.

BY C. R. CROSBY, ITHACA, N. Y.

The brilliant red nymphs of *Heterocordylus malinus* Reut., and *Lygidea mendax* Reut., are found during May and June abundantly on the leaves and fruit of the apple in many parts of New York State.

The eggs of both species are laid during the summer, and are inserted their full length into the bark on the smaller branches, two-year-old wood being preferred. The eggs are very difficult to find, and I have not been able to make as many observations on them as desirable. All the eggs definitely known to belong to *H. malinus* were found inserted in slits in the bark at the base of the fruit spurs. As far as I have observed, the normal number of eggs for each cavity is four. Each egg is 1.6 mm. long by .4 mm. wide. It is rather strongly curved, slightly compressed and dull whitish in colour. The embryo develops in the lower enlarged portion, its head being some distance from the tip of the egg. The woody tissue of the bark, especially the outer portion, adheres so closely to the egg that it is impossible to remove it completely, even when hardened in alcohol.

The eggs of *L. mendax* are usually inserted in pairs in the lenticels of smooth two-year-old wood. They do not lie parallel to each other, but diverge at a wide angle in order to avoid the solid wood, since they are longer than the thickness of the bark. In size and shape they closely resemble the eggs of *H. malinus*.

The eggs of both species hatch soon after the opening of the apple buds, and the nymphs feed on the leaves and also attack the fruit as soon as it sets. In the Cornell Insectary I have reared both species to the adult stage exclusively on foliage.

As the nymphs grow older they become more active, and when disturbed retreat to the twig, where they adroitly dodge to the opposite side like a squirrel. They will frequently drop suddenly, but rarely fall to the ground, usually alighting on another branch. They have a curious way of getting a new hold. The posterior end of the alimentary canal can be extruded, and is covered with a viscid secretion. As soon as they strike an object in falling, this sticky organ adheres to it until the insect can regain its foothold. When confined in a glass bottle young nymphs become attached in this way so firmly to the glass that they cannot escape, and so perish.

Both species pass through five immature stages, and attain wings at the fifth moult. Under natural conditions the time required for the nymphs to reach maturity varies considerably with the weather. In the Cornell Insectary, which is heated by steam, *H. malinus* required about 35 days, and *L. mendax* about 37 days. Under these conditions each stage lasted about one week. A longer time is required in the orchard.

The young nymphs of the two species are quite similar. Those of *L. mendax* may be distinguished by their brighter red colour, the absence of dusky markings on the thorax, and by having the body clothed with fine short black hairs. The nymphs of this species retain their bright colour until fullgrown, while those of *H. malinus* become nearly black on the thorax after the third moult. In the nymphs of *H. malinus* the beak is dusky, while in the other species it is nearly colourless, with a black tip.

DESCRIPTION OF THE NYMPHAL STAGES.

H. malinus.

Stage I.—Length, 1.2 mm. General colour a light tomato red. Each segment of the thorax has a large, transverse, medially interrupted dusky area, the one on the metathorax being smaller than the others and obliquely truncate laterally. Head dusky, with two oblique light lines, which on the vertex meet the median line of the thorax. Legs, antennæ and beak slightly dusky, the antennæ yellowish-red at the joints. As growth takes place the first and second abdominal segments shorten and the constrictions become deeper.

Stage II.—Length, 1.7 mm. Head dusky reddish. Thorax with the median line and the posterior margin of the pro- and mesothorax red, the rest dusky over a red ground colour. Abdomen tomato-red, with irregular lighter markings towards the sides; first segment with a broad transverse dusky spot, the second with a smaller one, the next six segments each with a very small spot, and the ninth with a large dusky area. Legs and antennæ dusky over a red ground colour. Beak dusky. Under parts tomato-red, except a small dark area just above the base of each leg.

Stage III.—Length, 2.2 mm. Head and thorax dull reddish. A small white area below and behind the eye. The wing-pads begin to show on the mesothorax. Abdomen with a median row of dull reddish spots, those on the first, second and ninth segments the largest. General colour of abdomen bright red, variegated with white laterally, the white markings more pronounced anteriorly. Narrow posterior margin of first and second

segments white. Antennæ dull reddish, lighter at the joints. Legs dull reddish, dusky distally. Beak dusky.

Stage IV.—Length, 2.5 mm. Head and thorax as in preceding stage, except the red is darker and the median line is whitish. Narrow posterior margin of prothorax bright red. The wing-pads extend to the third segment. Abdominal marking as in preceding stage, except that the median reddish-brown areas are larger, and all but the anterior margin of the ninth segment is of this colour. Legs, antennæ and beak darker than in the last stage.

Stage V.—Length, 4.3 mm. Head and thorax dull black over a red ground colour. Median line of thorax whitish. First and second abdominal segments nearly black over reddish, posterior margin of each white; third to eighth segments light red, variegated with lighter markings, and there is a median longitudinal row of large transverse reddish black spots. Ninth and tenth segments reddish-black except the red anterior margin. Legs and antennæ nearly black, with a reddish ground colour. Abdomen beneath lighter red, with a submarginal row of small black spots; ninth ventral segment nearly covered by a large black spot; a smaller one on the eighth.

L. mendax.

Stage I.—Length, 1.5 mm. General colour tomato-red. A distinct whitish ring around eye. Thorax slightly dusky over a red ground colour. Legs dusky, antennæ brownish, beak colourless, with the tip black. Whole dorsal surface clothed with short stiff black hairs.

Stage II.—Length, 2.5 mm. Very similar to last stage. Antennæ dusky brown, last segment lighter except at base. Tylus dark.

Stage III.—Length, 2.5 mm. The wing-pads just begin to show on the mesothorax. Coxæ tomato-red, rest of legs and beak translucent, slightly dusky; posterior tibiæ brownish. Tylus dark brown. Legs clothed with stiff black hairs.

Stage IV.—Length, 3.25 mm. Very similar to last stage in colour. The wing-pads extend nearly to the posterior margin of the second abdominal segment.

Stage V.—Length, 4 mm. Wing-pads extend to fifth abdominal segment. General colour bright tomato-red, tip of wing-pads and line along scutellum dusky. Legs dusky, darker towards the tip. Antennæ dusky, nearly black; last segment brownish at base. Tylus jet black.

Last two abdominal segments with a broad median dusk mark on the dorsum. Whole body clothed with short, fine, black hairs.

Oviposition has not been observed, but probably takes place during June and July, but in the case of *L. mendax* it may be deferred till September, as Reuter records adult specimens captured during that month.

I have reared the nymphs of both species from apple branches sent in from Brockport, Syracuse, Albany, Waterloo, East Palmyra, Lafayette, and Batavia, N. Y. In some apple orchards they are serious pests, deforming with their feeding punctures a large proportion of the fruit of certain varieties.

A NEW SPECIES OF PHALANGIDA FROM MISSOURI.

BY CYRUS R. CROSBY, ITHACA, N. Y.

Nemastoma dasyncnemum, n. sp.—Length, .95 mm.; width of abdomen, .59 mm. General colour in alcohol very dark brown, in life nearly black; in one specimen the body is distended, making it appear white, with black markings, but in the other, which was studied alive, this is not the case.

Cephalothorax squarely truncate in front, with the lateral angles oblique when viewed from above. Eyes small, situated on a low tubercle close to the anterior margin, separated by a little less than their diameter, each one surrounded by a series of sharp black spines. Frontal pieces of the cephalothorax two in number, transverse, contiguous and gradually enlarged laterally. Two-thirds the distance from the eyes to the posterior margin of the cephalothorax there is a distinct transverse groove, which becomes indistinct at the sides. In the distended specimen the thickened parts of the tegument are separated from each other and contrast sharply with the snow-white connecting membrane. The first five dorsal abdominal segments are united into a single piece, free from the cephalo-

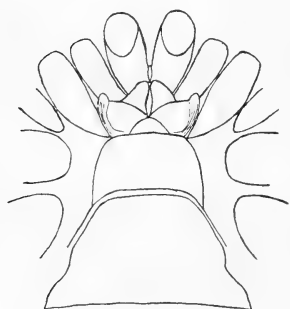


FIG. 1.—Ventral view of mouth-parts

thorax, and with the anterior and posterior margins convex. The sixth, seventh and eighth dorsal segments are represented by narrow, transverse sclerites. On the ventral side five segments are distinguishable. The first is large, narrowed in front and separated from the terminal portion by a

distinct suture ; terminal portion rectangular, with the anterior margin slightly convex. Second, third and fourth segments linear, fifth much wider. The anal piece consists of three parts: the superior part (pygidium) semicircular, the two lateral anal valves small and triangular ; the anal sternite represented by a small dark spot scarcely hardened. Between the ends of the fifth ventral and eighth dorsal segments there is on each side a small, irregularly-shaped sclerite. The hardened parts are brown, with the surface slightly roughened by minute tubercles ; certain areas are, however, armed with larger tubercles less thickly placed, as follows : The entire cephalothorax, except the area between the eye tubercle and the transverse groove ; a large quadrate area on the anterior part of the large dorsal plate, indistinctly divided into three parts ; two transverse areas behind this ; narrow transverse areas on the sixth, seventh and eighth dorsal segments ; the entire surface of the pygidium, and the posterior part of the first ventral segment.

Coxæ of nearly equal length, trochanters globular, both are dark brown and armed with short black spines. Base of femur white and unarmed, rest of femur, patella and tibia brown, and armed with short acute perpendicular spines and long slender hairs, which in their basal half are at right angles to the segment, and in their distal half bent forward and somewhat matted together. The other segments pale, thinly clothed with slender oblique spines and very fine appressed hairs. Each tibia armed at the tip above with a short, stout, slightly curved, tooth-like spine. Tarsal claws unarmed.

Palpus long and slender, sparsely clothed with short, erect setæ ; trochanter armed below with three longer recurved setæ ; tarsus slightly clavate and more thickly clothed with setæ than the other segments. Chelicerae light gray, the claw armed with a series of fourteen teeth, of which the terminal two are the largest ; the opposing figure armed with about ten similar teeth. Preëpistome broad, convex and strongly chitinized, epistome produced into a sharp vertical ridge. Endites of the palpus white, triangular, with the outer margins slightly convex. Endites of the first pair of legs with a chitinized lateral border, curved and enlarged distally, inner portion white, with the anterior margin convex ; situated between them is a small semicircular sclerite, which seems to represent the sternum. Coxæ of the second pair distant from sternum and not provided with endites. (Fig. 1.)

In the following table the length of the segments of the legs and the palpus is given in millimeters. Owing to the difficulty of determining the division between the tarsi and the metatarsi because of the presence of several false articulations, I have for convenience in the table considered the first segment after the tibia as representing the metatarsus, the remaining segments the tarsus.

LEGS.	I.	II.	III.	IV.	PALPUS.
Tar.....	.13 .1 .24	.16 .13 .15 .25	.09 .06 .06 .24	.07 .06 .09 .27	.27
Total .....	.47	.69	.45	.49	
Met .....	.39	.57	.4	.57	
Tib.....	.4	.66	.43	.64	.43
Pat.....	.13	.13	.13	.15	.4
Fem.....	.55	.72	.48	.64	.52
Tro.....					.24

Three specimens, Columbia, Mo., November 8 and 20, 1904, July 12, 1905, collected under leaves on a heavily wooded north slope on the bank of Hinkson Creek.

I place this species in *Nemastoma* for the present, although it differs from it in the separation of the dorsal plate of the cephalothorax from the tergites of the abdomen, the presence of a transverse groove on the cephalothorax back of the eye tubercle, the exposure of the stink glands, the suppression of the anal sternite, and the dentition of the digits of the chelicerae.

RANDOM NOTES ON ENTOMOLOGICAL FIELD WORK.*

BY E. S. TUCKER,

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Opportunities often occur in entomological field work for the observation of interesting features of insect life apart from the main subject of investigation. Such features in many cases are presented in connection with the regular observations, but independently as time permits, casual

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January, 1911

attention at least can frequently be given to occurrences none the less worthy of record. My practice of keeping on the lookout for all kinds of insects or their work has led to some important economic discoveries, but my present paper is prepared with the object of bringing together some miscellaneous results for reference.

In several instances my specimens were submitted through Dr. L. O. Howard to experts in the Bureau, and his prompt attention and courtesy in furnishing reports of their determinations have greatly aided me. Each authority is given credit for such helpful assistance.

INSECTS TAKEN IN DRY COTTON BOLLS.

While making search for hibernated cotton-boll weevils, *Anthonomus grandis* Boh., other insects and a few myriapods have been taken under the same conditions, but not all of the specimens thus obtained have been specifically determined. However, the results of my collecting in two lower Red River localities of Louisiana may throw light upon the winter habits of certain species, as follows.

Old cotton bolls collected at Alexandria, La., February 26 and 27, 1909, harbored the forms here listed in addition to the boll weevil.

COLEOPTERA.

Apocellus gracilicornis Casey.—(Det. H. S. Barber.) Adult in fallen boll.

Apocellus sphaericollis Say.—Common. Adult in fallen boll.

Atenius abditus Hald.—(Det. E. A. Schwarz.) Adult in fallen boll.

Myochrous denticollis Say.—(See Additional Records.) Adult in fallen boll.

Anthicus confusus Lec.—(Det. H. S. Barber.) Adult in fallen boll.

Eudiagogus rosenschældi Fah.—Adult in abandoned cell of boll weevil in fallen boll.

Baris ærea Boh.—Adult in fallen boll.

Aræcerus fasciculatus De G.—Actively breeding in both hanging and fallen bolls, all stages from larvæ to adults; pupæ in one fallen boll attacked by mites, *Tyroglyphus breviceps* Banks. (See Additional Records.)

MYRIAPODA.

A few myriapods were found in rotten bolls on the ground. Their partial identifications by Mr. Nathan Banks are as follows: "The myriapods belong to three different genera, one near *Polydesmus*, one near *Julus*,

and one near *Lithobius*. The *Polydesmus* and *Julus* are vegetarians, the *Lithobius* is carnivorous."

Similar bolls collected at Mansura, La., March 1 and 2, 1909, directly after my visit at Alexandria, were found to harbour quite different species, and the list affords an interesting comparison.

COLEOPTERA.

Bradycellus rupestris Say.—Adult in fallen boll.

Melanophthalmus simplex Lec.—(Det. H. S. Barber.) Adults in hanging bolls.

Acylomus ergoti (Walsh) Casey.—Adults in hanging bolls.

Megilla maculata De G.—Adults in hanging bolls.

Cathartus cassiae Reiche [*gemellatus* Duv.].—Adults in hanging bolls. (See Additional Records.)

Cerotoma trifurcata Forst.—Adult in fallen boll.

Cassida bivittata Say.—Adult in hanging boll.

Anthicus fulvipes Laf.—(Det. H. S. Barber.) Adult in hanging boll. One emerging March 24, in isolation.

Tyloderma dentipes Pierce MS.—Adult in hanging boll.

Aræcerus fasciculatus De G.—Breeding in both hanging and fallen bolls, as at Alexandria.—(See additional Records.)

OTHER ORDERS.

Dicymolomia julianalis Wk.—(Det. H. G. Dyar.) A larva in hanging boll damaged by *Aræcerus fasciculatus* matured after isolation in a breeding jar. So far as known to me, the only published record of the occurrence of this lepidopterous species in cotton bolls is the statement of Dr. Dyar in Proc. Ent. Soc. Wash., v. XI, 1909, p. 66, though in habits it is considered as a scavenger.

Batrachetra Rileyi Wishm.—Larvæ of this moth were frequently found in fallen bolls associated with and without *Aræcerus fasciculatus* or its work. The larva is supposed to feed on insect remains. (See Additional Records.)

Cremastogaster lineolata Say, subsp. *leviuscula* Mayr, var. *clara* Mayr.—A solitary female of this ant in hanging boll, and five incipient colonies, composed of female, workers and young larvæ, in similar bolls.

Doru luteipennis Serv.—(Det. A. N. Caudell.) Adults of this earwig in both hanging and fallen bolls.

Schænomyza chrysostoma Lw.—(Det. D. Coquillett.) Adult fly from hanging boll emerged in breeding jar, March 19.

INSECTS TAKEN IN DRY CORNSTALKS.

Examinations of cornstalks in the same localities and on the same dates as mentioned for cotton bolls failed to disclose a single cotton-boll weevil, although the finding of this insect in stalk cavities probably formed by *Aræcerus fasciculatus* had been previously reported by the overseer of a plantation near Alexandria. The latter species was found to have bred extensively in the stalks, a large proportion of which, in consequence, presented a riddled condition on account of emergence holes opening from the larval excavations in the pith. These cavities afforded attractive retreats for other species, mainly in hibernation, and including common weevils that are apt to be mistaken for boll weevils.

The species thus found at Alexandria, La., are herewith recorded.

COLEOPTERA.

Languria mozardi Lat.—Adults mostly in cavities of *Aræcerus fasciculatus*.

Silvanus bidentatus Fabr.—Adults all in *Aræcerus* cavities. (See Additional Records.)

Paromalus conjunctus Say.—Adults in broken stalks on ground.

Carpophilus hemipterus L.—Adult in *Aræcerus* cavity.

Moncrepidius bellus Say.—Adults in broken stalks on ground.

Atenius abditus Hald.—(Det. E. A. Schwarz.) Adult in broken stalk on ground.

Atenius cognatus Lec.—(Det. H. S. Barber.) Adult in broken stalk on ground.

Myochrous denticollis Say—Adults rather common in *Aræcerus* cavities. (See Additional Records.)

Chaetocnema denticulata Ill.—Adult in *Aræcerus* cavity.

Tanymecus confertus Gyll.—Adult in *Aræcerus* cavity.

Eudigogus rosenschældi Fah.—Adults in broken stalks on ground.

Chalcodermus æneus Boh.—In one field wholly in *Aræcerus* cavities ; cowpeas had been grown in this corn-field. In another field, found in broken stalks not attacked by *Aræcerus fasciculatus*. Common, and apt to be mistaken for the boll weevil.

Calandra oryzae L.—Adults commonly found in stalks not attacked, as well as in *Aræcerus* cavities. Apt to be mistaken for the boll weevil. (See Additional Records.)

Stephanoderes, near *hispidulus* Lec.—(Det. A. D. Hopkins.) Two adults in dry stalks on ground, the stalks being perforated by fine pin-hole channels made by the beetles. (See Additional Records.)

OTHER ORDERS.

Cremastogaster lineolata Say, subsp. *leviuscula* Mayr, var. *clara* Mayr. These ants occurred in *Aræcerus* cavities.

Cælioxys rufitarsis Sm.—Two leaf-rolled pupal cells of a *Megachile* bee were found in pith of dry stalk on ground; a male *Cælioxys rufitarsis* emerged from one cell March 30, and dissection of the other cell disclosed a nearly matured male of same parasitic bee in its own pupal case within the *Megachile* pupal case.

Geocorus punctipes Say.—(Det. O. Heidemann.) Adult bug in stalk attacked by *Aræcerus fasciculatus*.

Cardiastethus assimilis? Reut.—(Det. O. Heidemann.) Adult bug in stalk attacked by *Aræcerus fasciculatus*.

ADDITIONAL RECORDS OF INSECTS FROM COTTON AND CORN.

A number of species already mentioned have been taken at other times either hibernating in or attacking the same host-plants, and the following additional records are given, including mention of further species in relative connection.

Silvanus bidentatus Fabr.—Found in dry standing cornstalks at Alexandria, La., during my first examination for *Aræcerus fasciculatus*, September 18, 1908.

Cathartus cassiæ Reiche [*gemellatus* Duv.]—Collected on matured cornstalks and a damaged ear at Alexandria, La., September 18, 1908, and besides was reared from stalks attacked by *Aræcerus fasciculatus* in same field, emerging October 29. At Sherman, Tex., on November 25 of the same year, the species occurred in dried cotton boll. Mr. J. D. Mitchell found it in old cornstalks attacked by *Aræcerus fasciculatus*, at Victoria, Tex., March 6, 1909.

Typhwa stercorea L. [*fumata* L.]—Reared from corn ear collected in field at Shreveport, La., September 24, 1908, emerging October 3.

Carpophilus dimidiatus Fabr.—(Det. H. S. Barber.) Collected on corn ear in field at Alexandria, La., August 2, 1909.

Conotelus stenoides Murr.—Taken in dried cotton boll at Sherman, Tex., November 25, 1908.

Ligyris rugiceps Lec.—At Gurdon, Ark., on June 25 of the present year, field corn was found to have suffered greatly from attacks of this beetle, specimens of which were dug from the ground close to the corn roots. The injuries were primarily caused by ragged wounds gnawed in base of stalks, usually just above the roots, but also beneath them at the extreme base. Two plantings reported ruined in this manner, and the third was being worked on. Only casual examination made owing to limited time, but enough seen and learned to prove extensive damage.

Myochrous dentibollis Say.—Common on cotton squares and green cornstalks at Shreveport, La., September 24–25, 1908; and on green corn at Alexandria, La., August 2, 1909. At Plano, Tex., on April 3, 1909, a field of corn with sprouts about four inches high was found badly damaged by the beetles, the tender leaves being eaten through in irregular holes and the stems gnawed. Some plants had stems broken at point weakened by attack. The beetles were found hiding in the earth around base of stems. Three counts of a number of plants gave the following percentage of injured ones: in middle of field, 50%; between middle and edge, 25%; near edge, 12%; average damage, 29%. Slight injuries were observed in a near field of same farm, but on another farm no attacks were noticed, though in this case the plants had barely appeared above ground. At the same place on May 5, the fields having been replanted owing to complete loss of first planting on account of frost, similar damage was noticed to a slight extent, but the beetles had become scarce.

Tribolium ferrugineum Fabr.—Matured May 5, 1909, from dry cornstalks attacked by *Aræcerus fasciculatus*, collected at Alexandria, La., September 18, 1908; also taken from similar stalks at Victoria, Tex., March 6, 1909, by Mr. J. D. Mitchell.

Calandra oryzae L.—Adult found inside a leaf sheath on matured cornstalk, September 18, 1908, at Alexandria, La.

Aræcerus fasciculatus De G.—For report of discovery in cornstalks, and other particulars, see "New breeding records of the coffee-bean weevil" (U. S. Dept. Agric., Bu. Ent., Bul. 64, pt. VII), and further records, "Additional notes upon the breeding of the coffee-bean weevil" (Jour. Econ. Ent., v. 2, No. 6, 1909, pp. 373–381).

Hypothenemus sp. and *Stephanoderes*, near *hispidulus* Lec.—(Det. A. D. Hopkins). Specimens of minute beetles and pieces of dry cornstalks were received from Mr. J. D. Mitchell, at Victoria, Tex., under date of

March 6, 1909. The stalks showed openings of minute tunnels, greatly resembling pin holes. These holes appeared on one stalk otherwise perforated by *Aræcerus fasciculatus*. Dr. Hopkins reported that the specimens taken from the stalks constituted two apparently undescribed species as designated. His remark will also apply to the *Stephanoderes* specimens collected by me at Alexandria, La., as previously mentioned. Similar work by these insects was later found by me in an upper joint of a green cornstalk, which, however, was beginning to mature, being found at Alexandria, La., August 2, 1909.

Batrachetia Rileyi Wlshm. — (Det. A. Busck.) In cornstalks infested by *Aræcerus fasciculatus*, or where it had worked and left, and decay had begun, numbers of the pink larvæ of this moth were living. They occurred particularly in rotting, rain-soaked stalks. Collected at Alexandria, La., September 18, 1908; adults matured in breeding cage on October 22 and 29. Larvæ also found frequently associated with or following the work of *Aræcerus fasciculatus* in green cornstalks, and sometimes in ear tips injured by corn-worm, *Heliothis obsoleta* Fabr., at same place, August 2, 1909. Mr. J. D. Mitchell submitted pupal cases taken from *Aræcerus* cavities in cornstalks at Victoria, Tex., March 7, 1909.

Monorium carbonarium F. Sm. — (Det. R. A. Cushman.) These ants were found by Mr. J. D. Mitchell in the cells of *Aræcerus fasciculatus* in old cornstalks at Victoria, Tex., March 7, 1909.

Pterodela pedicularis L. — (Det. N. Banks.) This Psocid bred in dry cornstalks attacked by *Aræcerus fasciculatus*, collected at Alexandria, La., September 18, 1908. Adults were taken in breeding cage October 29; and April 14 following.

Chaetopsis ænea Wd. — (Det. D. W. Coquillett.) Adult flies emerged August 10 and 23, from green cornstalks collected August 2, 1909, at Alexandria, La. The larvæ appeared to be associated with or following the work of *Aræcerus fasciculatus* in lower joints, occurring generally in spots at node or base of leaves.

Oscinis carbonaria Lw. — Adult flies emerged August 10 from green stalks as in preceding case, though apparently independent of *Aræcerus fasciculatus* attacks.

Oscinis trigamma Lw. — (Det. D. W. Coquillett.) Two adult flies emerged from old cotton boll, Dallas, Tex., March, 1909.

Gryllus Pennsylvanicus Burm. — A body of this cricket was found impaled evidently by a loggerhead shrike, otherwise called the southern

butcherbird, on an open prong of an empty hanging cotton boll in field of old stalks, at Wolfe City, Tex., January 20, 1909. This record affords interest from the fact that cotton bolls may be utilized in such manner in place of thorns or wire-fence barbs. The cricket had been pierced sideways in the thorax by the point of the boll.

Geocoris bullatus Say.—See "Propensity of Plant-bugs for Biting Persons."

Atomoscelis sericatus Reut.—See "Propensity of Plant-bugs for Biting Persons."

ARACHNIDS FROM SPANISH MOSS.

In further connection with the hibernation of boll weevils, a quantity of Spanish moss, *Tillandsia usneoides* L., was examined at Natchez, Miss., during the middle of May, 1909. The few insects found besides the boll weevil have not yet been studied, but the arachnids have been identified by Mr. Nathan Banks, as follows :

Liobunum vittatum Say.

Zelotes sp. (immature).

Anyphæna fallens Htz.

Theridium spirale Emer.

Grammonota maculata Bks.

Philodromus pernix, Blk.

Dendryphantès octavus Htz.

PROPENSITY OF PLANT-BUGS FOR BITING PERSONS.

Several times during August, 1909, at Dallas, Tex., I was annoyed by being bitten on my hands by little green leafhoppers, which bounded away as soon as I gave a jerk on feeling the bite. These insects entered my room at night through the screens of open windows, being attracted by electric lights above my desk. Early in September specimens were captured in the act of biting me, and their identification by Mr. O. Heide-mann was reported as *Empoasca mali* Le B. The same species was again detected in biting me during July, 1910, and subsequently another occasion was presented for observing its attack from start to finish. This last occurrence happened on the night of October 2. From the time my attention was first attracted by feeling the bite until the insect desisted, a trifle over four minutes elapsed according to my watch. The insect was then captured, and after being crushed on a white sheet of paper, a faint bloody streak was produced, which proved beyond any doubt that the specimen had actually engorged itself with blood.

On the night of October 5 a cool northerly wind brought a sudden decline of temperature, and myriads of small bugs invaded dwellings and late business rooms wherever lights attracted the insects and nothing barred their way besides the ineffectual screens. In swarming around the lights, they caused a distractive annoyance to persons within range of their movements, more than on any preceding night. My daughter complained that the insects bit her, and her neck showed three small lesions, each of which was the nucleus of a stinging irritation. The insects were accused of being the culprits, because she had brushed them away. A quantity of the insects which fell from the light globes and died were collected and examined next morning. Nearly all were leafhoppers, of the family Jassidæ. A few heteropterous plant-bugs were among them. The prevailing species of leafhopper was *Athysanus exitiosus* Uhl., which outnumbered *Deltocephalus inimicus* Say, at the rate of 100 to 6. *Empoasca* was much more abundant than *Deltocephalus*. Only a single specimen of another Jassid appeared in the examination.

No record of such abnormal habit concerning these insects or other related species is known to me, but two of my associates have declared that they as well as some members of their families have been bitten by leafhoppers of common size, at various times and places, even during the recent abundance of these insects at lights in Dallas.

Another bug, to which my attention was drawn on account of its stinging bite on the back of my hand, was recognized as *Triphleps insidiosus* Say. This attacked me while doing field work on May 10, 1910, at Dallas, Tex.

Still another species, which proved to be *Geocorus bullatus* Say, has been brought to notice by an associate, Mr. Harry Pinkus, who was examining cotton plants with me in a field at Plano, Tex., July 12, also in 1910, when he captured the bug in the act of biting his hand.

An additional species, which agreed with identified specimens of *Atomoscelis serieatus* Reut., belonging in the family *Miridæ* [*Capsidæ*], was taken in the act of biting the back of my hand while I was engaged in writing at my desk at night under electric lights, September 8, 1910, at Dallas, Tex. Its persistency in biting until I could obtain a cyanide bottle and capture it is strong evidence that it attempted to feed on blood, and perhaps succeeded; in fact, it seemed loth to relinquish its attack even after being enclosed by the mouth of the bottle. The bite

produced a sharp stinging sensation, much like a mosquito puncture, and left a faint pale spot on the skin. Its rostrum was distinctly perceived to be directed into my skin. The species has otherwise been collected by me at the following places in Texas: Goliad, June 16, 1908; Pearsall, July 12, 1908, taken on Croton weed; and at Dallas, August 11, 1908, on cotton.

The biting of these insects, as mentioned, may possibly be induced by mere force of habit, since they live on many kinds of plants, but in view of the supposition that they attack an animal by mistake, I had doubted up to the time of my last experiences that they would actually feed on blood. Really, I had not suffered myself to endure the stinging sensation of a bite long enough for an insect to effect more than a puncture, until my last experience took place.

MORTALITY OF AN ANTHOMYID FLY DUE TO FUNGUS.

The occurrence of dead flies hanging on the wire screening of the insectary at Dallas, Tex., attracted my attention on March 29, 1910. On examination, fungus spores were observed in clusters on the bristles of the abdomen and on the legs of the flies, which proved to be the species *Phorbia fusciceps* Zett., whose larvæ are widely injurious to roots of vegetables. Maggots, which afterwards matured as this species of fly, have been taken while depredating on bean roots in a truck patch at Dallas, Tex., April 10, 1909. The disease, however, seemed to act upon the flies during night, since the dead bodies were noticed in new places for several mornings, being found attached to the leaves of an ash tree on April 12, by Mr. H. Pinkus. Specimens were submitted to Vera K. Charles, of the Bureau of Plant Industry, Washington, D. C., who gave the following report: "The fungus is a species of *Empusa*, probably *Empusa muscæ*, Cohn. This host is not represented in our collections, nor has the fungus been reported upon it."

DANGER OF POLLUTION BY HONEYBEE.

At an open public privy in Hackett, Ark., on September 13, 1910, chickens and insects were observed to have free access from the rear to the excrement on the ground. Although lime had been used to disinfect the place, the recent deposits on top nevertheless attracted numerous flies, and among them a worker honeybee was seen investigating the polluted matter. It alighted on and examined one vile spot after another.

What significance the conduct of this bee might have in the pollution of honey in its hive can only be imagined. I learned that some hived bees were kept near town.

THE SHRUB, *CEANOTHUS OVATUS*, DESF., AS A HOST-PLANT.

On April 7, 1909, my attention was drawn to this shrub growing near Dallas, Tex., on account of the occurrence of scale insects on the main stem. The specimens were identified by Mr. J. G. Sanders as *Lecaniodiaspis celtidis* Ckll., which has been found extensively infesting hackberry trees in the city. Mr. Sanders remarked that the shrub "seems to be a new food-plant for this species."

From elongate gall formations on the branches, the moth determined by Mr. A. Busck as *Stagmotophora ceanothiella* Cosens, emerged on the 7th, 12th, 14th and 19th of the month.

On the flowers the moth, *Scythris albilineata* Wlshm. (det. A. Busck), was taken; also the flies, *Geron senilis* Fabr., and *Phorbia fusciceps* Zett. (both det. D. W. Coquillett); and two male sawflies identified by Mr. S. A. Rohwer as his species *Hylotoma grandis*. In addition, two species of Chrysomelid beetles were collected, their determinations being made by Mr. Frederick Knab as *Cryptocephalus notatus* Fabr., and *Diachus auratus* Fabr.

OCCURRENCE OF A LEAF-ROLLER ON *VIBURNUM PRUNIFOLIUM* L.

On same date and near the same place of collection as for the directly preceding records, the rolled leaves of the stag-bush or sloe, also improperly called the black haw, were found to occur extensively. These distortions were due to the work of caterpillars, one of which was enclosed or had pupated in every curled leaf. The moth, *Anacamptis rhoifrutella* Clem. (det. A. Busck), matured from collected rolls, on May 8 and 10.

In closing these notes for the present, mention might be made concerning the unfavourable seasons of 1909 and 1910 for the collection of insects in Texas. On account of the unusual hot and dry weather which prevailed, there has been a marked restriction in the occurrence of many insects, resulting particularly in a deficiency of observations upon breeding habits. From the records and special notes herewith presented, I trust, however, that some advance in information is gained.

SOME BEES FROM WESTERN CANADA.

BY T. D. A. COCKERELL, UNIVERSITY OF COLORADO.

I am indebted to Dr. C. Gordon Hewitt for the loan of a small collection of bees obtained by Mr. T. N. Willing, of Regina, Saskatchewan. Although the number of species is not large, several are new to the Canadian fauna, or otherwise of interest. It is in this region that the arid transition zone enters Canada, and consequently, any one who will collect diligently there is sure to find a considerable number of species not otherwise known as Canadian. I have omitted from the list three species of *Andrena*, two from Regina and one from Mortlach. I do not recognize these at once, and it may be that some or all are new, but it does not seem worth while to spend time on them until Mr. Viereck's paper on the genus has been published.

Colletes salicicola geranii Ckll.—1 ♂, Pincher, Alta., July 10, 1904.

Halictus lerouxii ruborum Ckll.—♀, Mortlach, Sask., May 31.

Halictus trizonatus Cress.—♀, Mortlach, May 31.

Agapostemon texanus Cress.—♀, Mortlach, May 31, 1909.

Andrena cockerelli Græn.—♀, Lipton, Sask., June 5, 1907.

Halictoides maurus Cress.—♀, Kinistino, Sask., July 26, 1907.

Coelioxys ribis Ckll.—♂, Prince Albert, Sask., July 27, 1907. Like the male of *C. ribis kincaidi*, but hair a purer white, and scutellum subangulate in middle, with the lateral teeth short as in *ribis* ♀.

Osmia novomexicana Ckll.—Medicine Hat, Alta., one ♀, May 30, 1904.

Anthidium tenuifloræ Ckll.—♀, Radisson, July 29, 1907; ♂, Suks-town, July 18, 1909.

Megachile calogaster Ckll.—♀, Meota, Sask., July 8, 1906; ♀, Swarthmore, July 15, 1910; ♂, Macleod, July 2, 1904.

Megachile manifesta Cress.—♂, Davidson, Aug. 21, 1907.

Megachile (Sayaphis) pugnata Say.—♂, Radisson, July 29.

Megachile (Anthemois) infragilis Cress.—♂, Regina, July 11, 1909. A form with the light hair yellowish-white. Anterior coxæ with no spines.

Megachile relativa Cress.—Four ♀'s, three from Regina, Aug. 24, Sept. 4 and 7, one from Davidson, Aug. 21. Peculiar for having the hair on last dorsal abdominal segment partly or mainly black instead of orange.

Megachile latimanus Say.—♀, Regina, Aug. 15.

Melissodes confusa Cress.—Males from Meota, Sask., July 8; Macleod, July 8; Radisson, July 29; Prince Albert, July 28.

Tetralonia medicata, n. sp.—♀, Medicine Hat, Alberta, May 30, 1904. Length, about $14\frac{1}{2}$ mm.; like *T. atriventris* Sm., but pygidial plate narrower (as in *fuscipes* Rob., from Washington, D. C.); hair of head (except occiput), of pleura and under part of thorax, *all black*, of thorax above creamy white; hair of legs black, or nearly, except on inner side of anterior and middle tibiae and anterior tarsi, where it is reddish, on middle tarsi, where it is red, brilliant on inner side, and the scope of hind legs, which is golden red; clypeus coarsely, irregularly punctured, with a median ridge; mesothorax dull, finely granular; mandibles with an orange patch; wings not so brown as in *atriventris* or *fuscipes*; abdomen without bands.

When working on this species, I had occasion to examine a cotype of Cresson's *Melissodes dubitata*. The specimen, which agrees excellently with the description, shows that *dubitata* is not *Tetralonia atriventris*, as has been supposed, but is a valid species of true *Melissodes*. It is readily distinguished from *T. atriventris* by the clypeal structure and sculpture (punctures very dense) and the shining mesothorax.

Anthophora bomboides Willingi, n. subsp.—♂, Prince Albert, Sask., June 18, 1905. Rather small; pale hair wholly dull white; middle of thorax with a small amount of black hair; first *two* abdominal segments with pale hair (first *three* in true *bomboides*); sides of second segment posteriorly with black; third and following with black hair; scape with a small light spot; clypeus yellow, except a crescent-shaped black mark on each side, the convexity inward, and the lower inferior corners broadly; *lateral marks reduced to narrow stripes contiguous with the black part of clypeus*; labrum yellow, except lateral and apical margins, and the usual lateral spots. Proportions of antennal joints, venation, toothed hind basitarsi, etc., normal.

A DECISION ON MEIGEN'S 1800 PAPER.

BY J. M. ALDRICH, MOSCOW, IDAHO.

In the CANADIAN ENTOMOLOGIST of October, 1908 (pp. 370-373), I published a discussion of this paper of Meigen's, to which I added a brief item the next month (p. 432). Some time afterward, learning that the International Commission on Zoological Nomenclature was accepting certain nomenclatural questions for consideration, expecting to render opinions on them, I sent to Dr. Charles Wardell Stiles, secretary of the Commission, copies of what I had published on the Meigen paper, and asked him to have the question taken up by the Commission. I did not precisely specify the question to be considered, but simply gave him my

January, 1911

discussion, my idea being to ascertain whether the 1800 names would be considered valid.

The opinion of the Commission was delivered to me last May, and has lately been published among others in circular form by the Smithsonian Institution (Smithsonian Publication, No. 1989, p. 68, October, 1910).

The question is taken up in the following form :

"The question primarily before the Commission is whether Meigen's 'Nouvelle Classification' has been published or not."

Omitting the discussion, the conclusion is given in the following paragraph :

"In the face of this evidence submitted by Doctor Stejneger, it cannot be doubted that Meigen's paper has been published in the sense of the International Code, and the Secretary concurs with Doctor Stejneger in submitting to the Commission the motion that the Commission is of the opinion that the generic names in Meigen's Nouvelle Classification, 1800, must take precedence over those in his Versuch, 1803, in every case where the former are found valid under the International Code."

This motion was agreed to by eleven commissioners, four not voting; none voting in the negative.

After receiving this decision, on May 31, 1910, I wrote Mr. Stiles a letter, in which I said :

"I do not find that you have touched the point at issue. In my published articles on the matter, which I sent you, I did not dispute that the paper was published in 1800. The question is whether the 1800 names were accompanied with enough data to make them valid. And on this I still await a decision."

Mr. Stiles's reply concludes with the following paragraph :

"You summarize your point of view in the following sentence : 'The question is whether the 1800 names are accompanied with enough data to make them valid.' My view is that this is a question for you and other specialists to answer zoologically. The opinion in question as written is to the effect that they are *available*, and this is a question of the Code. Whether they are *valid* involves a question of systematic zoology, namely, can specialists recognize what is included under those names."

The foregoing facts will, I think, show that the Commission did not only not decide against my contention, but that the Secretary expressly says that the essential feature of the case does not lie within the jurisdiction of the Commission, and cannot be acted upon by them.

BOOK NOTICE.

Genera Insectorum dirigés par P. Wytzman, Coleoptera Adephaga, fam. Carabidæ, subfam. Cicindelinae, von der Walther Horn, 1910. Fascicule 82b avec planches, 6-15.

This, the second part of Dr. Horn's "Cicindelinae," has recently come from the press, and is devoted to the platysternale phylum, including the tribes Mantichorini, Megacephalini and Cicindelini. The general plan follows that indicated in the review of the first part (vide CANADIAN ENTOMOLOGIST, 1910, p. 65), but so many items of interest to American entomologists appear that it seems worth while to notice them in some detail.

Under Dr. Horn's arrangement, our genera, *Amblychila* and *Omus* (together with the South American *Pycnochila*), form the subtribe Omina of the tribe Megacephalini. Of *Amblychila*, two species are recognized, *cylindriciformis* Say (with the subspecies *picolominii* Reiche), and *baroni* Rivers (with the subspecies *Schwarzi* W. Horn), the recently described *longipes* Csy. ranking as a synonym of *baroni*. In *Omus* only three species are recognized, *dejeani* Reiche, *submetallicus* Horn, and *californicus* Esch. The first two of these are without synonymy, but the string of names assigned to subspecific or other local forms of *californicus* is a long one. Those given specific rank are (1) *vandykei* W. Horn, (2) *audouini* Reiche, (3) *ambiguus* Schpp., (4) *punctifrons* Csy., (5) *sequoiarum* Cr., (6) *fraterculus* Csy., (7) *horni* Lec., (8) *levis* Horn, (9) *edwardsi* Cr., (10) *intermedius* Leng, (11) *lecontei* Horn, (12) *fuchsi* W. Horn. This leaves about two dozen of the names applied by LeConte, W. Horn and Casey with no higher value than that of synonyms. The reviewer is bound to confess that his own series of *Omus* is too small to throw any light upon the matter. *Tetracha*, which is made a subgenus of *Megacephala*, of the subtribe Megacephalina, gets through with no change of name in our two species. The arrangement of the Cicindelini is not completed in this section, but it is divided into two subtribes, only one of which (Cicindelina) is found with us. This has not been reached, but the next part, containing it, will be looked forward to with interest and perhaps with some apprehension by subscribers to the work.

Something should be said of the plates, which are beautifully executed, and illustrate a large number of exotic forms, as well as a few from North America. As in the preceding part, a good share of the drawings are devoted to structural details. The work as a whole is to be recommended to all naturalists interested in phylogenetic studies, since it represents the views of a writer who considers the insect not as a mere separate entity, but in relation to life as a whole. H. F. WICKHAM.

Mailed January 12th, 1911.

The Canadian Entomologist.

VOL. XLIII.

LONDON, FEBRUARY, 1911.

No. 2

NEW HISTORIES AND SPECIES IN *PAPAPEMA* AND *HYDRÆCIA*.

BY HENRY BIRD, RYE, N. Y.

(Continued from Vol. XLI, page 118.)

The environs of large cities are often prolific of *Papaipema* species, which, in comparison with rarer forms of other Noctuids, quite surprise one at first. While the flora of a section must indeed be indicative of the species to be expected, it is an undisturbed and unburned flora that at this day exerts a lasting influence on the perpetuation of these moths. So it happens the very urbanity which drives much insect life away helps, through lessening the indiscriminate burning of neglected areas, where a fire might be dangerous to buildings, to allow many species of this genus to breed in good numbers. Although a preferred indigenous food-plant has been established for most of their known larvæ, there is one introduced weed to which a great many will substitute upon necessity, this is the common Burdock, *Arctium*, and its prevalence in vacant city lots and waste places is sure to be detected by some of these boring larvæ. In fact, it is hard to find an extended growth of Burdock that is not bored by some Papaipemid, though *cataphracta* and *nebris* are the species to be generally expected. Investigations around Buffalo, N. Y., show an unusual number of species in *Arctium*, and several unfamiliar forms are bred. The primitive flora and fauna of this section must have been very rich; the extreme fringe of the prairie zone here met the general Atlantic State forms, with conditions of damp bottom lands and water margins in proximity to the sand-dune life of the lake shore. It certainly reflected many varied characteristics, as is evidenced by the flora of Niagara Glen to-day.

Opportunity was offered to observe *Papaipema harrisii* in well-established colonies, and the following notes are additional to published data:

The wide dispersion of *Heracleum lanatum*, the preferred food-plant of this species, would naturally suggest some environmental forms, but aside from this, much instability in colour of the imago is found in every colony, and the range of variation seems most marked with it. We may use the term colony, for though in no sense gregarious, the persistent

nature of *Heracleum* in circumscribed areas permit broods to continue and inter-breed for a great many consecutive years. Hence the more apparent reason for environmental forms. And it is not the moth alone which shows variability, the larva exhibits a feature of individual instability with a tubercle plate which has not been observed with others. As only the mature larva has been described, attention may be drawn to the rest of the life-cycle which follows the normal routine. Ova deposited in September winter over and emerge during the last week of May. The early stages of the larva show the characteristic markings; colour light brownish-maroon, which becomes very dull in the penultimate stage, with longitudinal lines white. The dorsal line is continuous, the subdorsal is broken on joints four to eight. This feature places the larva in the grouping to which *nebris* and *marginidens* belong, and holds with each stage except the last. The tubercles are as usual, well marked and normal for the genus, excepting the accessory IVa, on joint ten. This is small, never as large as IV on the preceding joints, as holds with *cerussata* for instance. Its uncertain accession is marked in that some specimens have it and some do not, and, further, that an individual may have IVa on one side and not on the other. The thoracic and anal shields are of the usual prominence, and at maturity the colours fade to a soiled, whitish translucence. Crochets of prolegs in single row of equal length, hooking out from a broadly U-shaped setting, colour brown, number twenty; as contrasted to *cerussata*, where the number is twenty-two, colour black and the hooks slightly larger. Larvæ leave plant for pupation; July 25-31; moths emerge in four weeks.

A familiarity with the type form, the extreme of variation where the stigmata are black and the primaries darkly suffused, designated by Hampson as aberration No. 1, Vol. IX, Catalogue of *Phalænæ*, together with the usual intermediate variations, following a three-years' study of Buffalo material, has given the writer a fuller knowledge of *harrisii*, which seemed necessary before passing finally on two apparently allied forms. One is from California, a species discovered by Mr. F. X. Williams, of San Francisco, bred by him from larvæ boring *Cirsium occidentale*. He kindly forwarded a number of the pupæ within their borings where they had changed. One larva had died of a fungous disease, drying into a satisfactory specimen, and was seen to be of the common type, as shown by *harrisii* and *arctivorens*, but altogether seemed within the scope of a geographical race of the former. Satisfactory evidence to the contrary is now at hand, and the following name is proposed:

Papaipema erubescens, n. sp.

Form congeneric, front smooth, pattern typical. Head and thoracic vestiture yellowish or fawn, mixed with rosy-brown, collar tipped above in lighter shade. Antenna ciliate, with tuft of white scales at base. Primaries rather narrow, apex acute; basal, medial and terminal areas yellow, powdered with purple-brown; the ante- and postmedial areas dull purple, but contrasts are not strong, due to the more or less dense powderings. Postmedial line most prominent, indistinctly double, the inner line brown the outer dark purple. It projects very slantingly outward from the costa, making quick turn at vein six, thence nearly straight to inner margin, which it meets at a much less oblique angle. Stigmata usually white, sometimes entirely yellow; size normal, agreeing with typical *harrisii* in definition. The central mark of reniform and the outer middle portion always yellow, the orbicular shows a central brown dot. Secondaries pale yellowish, more or less roseate, always with smoky medial band and the veins showing a little darker. The under side is more glistening and densely powdered with smoky-brown. The genitalia conform to the normal type for the genus in the harpes, but the curved hook arising on the side is without the usual teeth on the posterior edge. Expanse, 36-40 mm. Habitat, San Francisco, Cal., and probably over the range of its food-plant in that State.

Eleven males are for comparison, and other specimens have been seen. A male type is in the author's collection, and cotypes are with Messrs. Möser and Williams.

While somewhat variable, *erubescens* will be easily recognized superficially and by the wing outline. The smooth hook or clasper of the genitalia is not duplicated exactly in any other species, except the Californian *angelica*, whereas the toothed form of this process holds with over thirty species, and is a feature emphasized by Prof. Smith as an exception for the Noctuids, at the erection of *Papaipema*. Mature larva similar to *harrisii* series in size and appearance. Head normal. Colour pale flesh-tint, whiter on last five joints, lines lost. Tubercles prominent, roughed; IIb, III and IV large and close together on thoracic joints; IV the largest on the abdominal ones, with no trace of IVa on joint ten. Shield smooth, glistening-brown; spiracles black. Pupa very cylindrical, though not apparently cramped in the barrow; similar to *impecuniosa*, though the latter is always wedged tightly in the boring. There is no unusual feature, no prominence on the front, and there may or may not

exist a small bifidate spur. Colour brown. Length, 18-20 mm. Dates of emergence of series, Aug. 25 to Sept. 14.

In the season of 1908 a number of nearly matured *necopina* larvæ were secured boring in Burdock about Buffalo. From this lot, supposedly all alike, a rather large, dark ochreous *Papaipema* moth appeared at an early date, being, in fact, the first specimen to emerge from a large series of various species. It had concolorous stigmata, and differed from anything previously seen. A relationship to *imperspicua* seemed most probable, and the next year the Burdock were closely observed for some unfamiliar larva which would prove this species. Nothing out of the ordinary could be detected, however, though the final aggregation from this plant again produced one of these aberrant moths. Mr. Møser, the local enthusiast, found, when emergence began, that he had succeeded in locating the oddity boring in *Angelica atropurpurea*, and secured a good series of the moths. In 1910 he sent on the larvæ, which seemed to work in *Angelica* as a preferred food-plant, though many occurred in *Heracleum* also, and the two last stages were observed. An extended series of the moths show the stigmata may become fully white, when they become comparable to a smoky variation of *harrisii* that is white-spotted. The result of the study is to conceive this form an aberration of the Grote species that is forsaking *Heracleum* as a staple diet, which probably represents a prairie race, and really gives an example of a species in the making. As it never seems to revert to the type form as exemplified by Kittery Point, Maine, material, and is in no sense a case of individual variation, and, indeed, may prove entirely distinct, a designation for it as an aberration of *harrisii* at least seems advisable.

Papaipema rubiginosa, new aberration.

Head, legs and thorax dull purple-brown, irrorated with yellow scales; abdomen lighter. Collar edged above with yellow, the spreading tuft of usual proportions. Fore wings dull yellow, with smoky-brown powderings more or less dense. At the hinder margin the yellow becomes brighter, due to less powdering. Basal and medial areas the same shade of yellow-brown; ante- and postmedial areas purple-brown, but with little contrast. Terminal space faintly lighter and yellower; as is also the apical patch. Basal line sinuous, double, filled in with yellow, not always well defined; antemedial line sinuous and indistinct; median shade line shows plainly from the lower end of the reniform, extending straight and obliquely to the inner margin paralleling the postmedial. The latter distinctly double and

nearly straight. The orbicular and claviform are indistinctly defined in dark purplish, sometimes partly outlined with bluish-white atoms. The reniform indistinct, the central lunulate line strongest and shown in yellow. Or the stigmata may be wholly pure white, but gradations between the two have not been seen. The hind wings are smoky-brown, paler in some specimens and usually show a medial shading. Beneath the medial lines are stronger, on a lighter, more luteous ground. Fringes slightly dentate. The male genitalia agree with the common type, does not differ to a noticeable degree from *harrisii*, or, for that matter, from *arctivorens*, *nebris* and others. Expanse, 38-42 mm.

Habitat.—Buffalo, N. Y.

A series of thirty-two specimens have been examined, and a cotype is in Mr. Möser's collection. *Rubiginosa* differ from aberration No. 1 of Hampson in general ground colour and in the definition of the postmedial line, which in the latter are counterparts of the typical specific maculation. Types of both forms are with the author.

The larva in penultimate stage is similar to *harrisii*, and is hard to differentiate by any character of notice. Head is a little larger, and the lines appear better defined, the dorsal alone being continuous. Tubercles normal, brownish-black, rather small. An accessory IVa, which is very small, occurs on joint ten, shields and leg-plates normal. Larvæ are thus far advanced about July 20.

At maturity the colour is a whitish translucence, the tubercles become blacker and larger, which is an unusual feature. On joint ten IVa becomes as large as IV on the preceding joint, and occupies a corresponding position. Some variation may exist in this, however. The setæ seem especially well developed, even those ventrally situated on the small tubercles on joints 4 and 5, that apparently merge into the leg-plates on the succeeding four joints, are easily discerned. Length, 42-44 mm. July 30 finds most larvæ full-fed and the borings deserted. The pupa is entirely normal. Emergence ranges from Aug. 17 to Sept. 9.

By far the finest disclosure for 1910 was the apprehension of a beautiful, distinct and unknown species at Buffalo by Mr. F. E. Möser. This new departure had escaped him by a narrow margin the previous season, but by persistent effort and an early beginning he was able to round up a species well worth the pains. As with other similar surprises in this genus, one wonders how such a thing has escaped notice so long. Its beautiful tints, comparable to a cross between a high-coloured

marginidens and *cerussata*, make it a very striking species, and though much smaller, would court notice at any collector's hands. The quest for the larva of *Xanthocia buffaloensis*, known only in the single example taken many years ago, which stands as the British Museum type of *Papaipema speciosissima* and *furcata*, taken in recent years in a few random imagoes at light, had served to keep an interest in larva-hunting, which now meets with this unexpected reward. Thus, in recognition of the persistent and skillful work done by Mr. Møeser in this group, it is fitting to dedicate this fine species to him.

Papaipema mœseri, n. sp.

Antenna slightly ciliate, front smooth, habitus typical. Vestiture of head and thorax rich purple, collar edged with cream, crests and tufts fully normal, abdomen dull purple-gray. Primaries short and stout, yet acute at apex; ground colour rich violet-brown, the medial area red, irrorated with yellow toward the inner margin, the ante-, postmedial and terminal areas purple, with a satin sheen; within the basal line the usual contrasting spots are yellow and not large, an elongate dot outside this line at its middle; antemedial line indistinct, very sinuous, touches lower edge of claviform and bends outwardly before reaching the inner margin, claviform two obliquely placed, rounded, white spots, the lower twice or three times the size of the upper; the orbicular, whose axis is in the same oblique line, is an irregularly rounded white spot, sometimes centrally marked with a brown dot; reniform large, the usual cluster of broken white spots around a yellow lunulate line, except the spot at the middle outer side, which is yellow; five yellowish dots on costa; postmedial line, two fine indistinct lines, beginning on costa above and very near the reniform, past which it sweeps in a full curve, nearly touching again the lower end, and thence nearly straight and oblique to the inner margin; the deep brown median shade is noticeable in its lower course across the median field; terminal line defined by an illumination of glistening orange scales, inwardly dentate between the veins and brightest near the apex; it serves to define the terminal from the postmedial areas, which otherwise would be a solid blending of rich purple gloss. Secondaries violet-gray, with a fine, indistinct medial line and terminal band. Beneath the violet-gray is darkened with smoky powderings. The male genitalia, though typical, shows some individuality; the lower lobe of the trigonate end of the harpes, as occurs with the *harrisii* group, is aborted, and the clasper-hook, bearing the typical teeth, seems finer and shorter. Its

design approaches *sciata* and *impecuniosa* most nearly. Expanse, 34-36 mm. Dates of emergence, Aug. 23 to Sept. 28.

Habitat.—Buffalo, New York City, N. Y.; Montreal, Que.

Eighteen examples furnish the description. A male and female cotype are with Mr. Møser, and a male type and female cotype are with the writer. *Møseri*, in its freshness, is very distinct from any well-known species. It is constant in colour and size, the only variation in the series being in the outward curve of the postmedial line where passing the reniform, which in one specimen angles inward at this point, deflecting the usual true sweep, and some specimens are a little yellower.

Nepheleptena Dyar is very close in some respects, but differs in the angle that the white spots bear to the costa. From a cotype sent to the National Museum Dr. Dyar inclines to concur in its distinctness. Unfortunately, *nepheleptena* is not represented by a very bright example in the unique type.

The writer has seen a great deal, first and last, of the species *cataphracta*, as will anyone who investigates *Papaipema* life-histories. It is the one general feeder, the only thorough plebian, the great ubiquitous nuisance. Its list of food-plants include about everything the other species eat, so one cannot help gathering them in along with desiderata, as well as a host of others. As the seeker in these larval investigations is always on the alert to detect some new food-plant being bored, the work of this species is constantly brought to the front and deplored, after the moment of hope that sprang from some new observation. Further than that, the larvæ change to pupæ within their borings, which adds to the flame, for one may happen on the pupæ in some new and likely food-plant, only to be disappointed later, after a long wait, for the moths are tardy in emerging.

Our fingers seem still to tingle from the great box of Nettle-roots which were once painfully gathered in, thinking the small pupæ contained therein would surely prove a novelty. Hope continued to mount until after the first of October, in this instance before the first *cataphracta* appeared, when the disappointment was correspondingly keen. Which is but one instance out of a great many. But there is a redeeming feature, its larva can be easily identified, for there is none other just like it, and upon a glance it may be returned to its newest food-plant. Further, if the plant is large and the stage late, one may detect its work by the large amount of frass thrown off, for it is a great gourmand, and no false hopes need be entertained for a moment. Yet it is not a common species in

flight, and many good collections of Noctuidæ are without a representative. This digression is but to emphasize the fact that the writer is familiar with the species, and in all the years up to encountering the Buffalo fauna we will say in pattern, colour and design it has been constancy itself. Not the faintest fleck of white has ever appeared in the stigmata for instance, the weak point in *Papaipema*.

But the Buffalo Burdocks seem replete with enigmas, and a darkly suffused, white-spotted form appears, which, did not more apparent intergrades exist to the normal form, would warrant the assumption of further specific departures. From circumstantial superficialities one would declare that the *necopina* and *cataphracta*, with which these plants are teeming, had irredeemably mixed, though their very numbers might argue against the need or likelihood of hybridism. Even *necopina* shows apparent taint in examples deeply powdered with the peculiar yellow tint of *cataphracta*, running to forms having a well-defined and white-marked reniform. Whatever the cause, the only facts known are that this peculiar aberration is produced from a larva having the full specific attributes of *cataphracta* in the last two stages at least. A rather striking feature with this new form is that it begins to emerge in August, whereas the type form rarely begins before Sept. 15, and continues until the middle of October, for New York State at least. A name for this form of *cataphracta* is considered desirable, and the following is proposed:

Papaipema fluxa, new aberration.

Vestiture of thorax purple-brown mixed with gray. Primary broad, entirely suffused with umber-brown, concealing more or less the yellow under colouring and the usual lines; ante- and postmedial areas faintly show a purple reflection; stigmata small and white-marked, or the orbicular and claviform may be lost entirely, or the reniform may show the outer spots yellow; a powdering of yellow scales over the lower median area, producing a patch at the apex, and a sprinkling is noticeable on the costa. Secondary the smoky-gray of the abdomen. The genitalia agrees with type form. Expanse, 34-38 mm.

A cotype is with Mr. Møser and a male type with the author.

Papaipema arctivorens Hmps.

The life-history of this species has never been fully recorded. It is an Eastern Canadian form, occurring commonly about the City of Montreal. Its larva bores in stems of *Arctium lappa*, *Cirsium lanceolatum*, *C. arvense*, *Dipsacus sylvestris* and other thick-stemmed weeds. A

preferred indigenous food-plant has not been associated with it, and its range is surely of a northern character. Its prevalence in *Arctium* was very marked in the season of 1909, all undisturbed waste places, even in the heart of the city that are productive of this weed seem to support flourishing colonies. *Cataphracta* and *necopina* occur with it in much less numbers, but the work of *arctivorens* is confined more particularly to the top of the plant. It prefers to pass most of its period in the parts at the head of the main stem or branches, which produces a more or less aborted growth. At the middle of July the midday sun causes a noticeable wilting of the growth above the cell-like boring, and as several examples are often in one plant, the effect becomes marked. Mr. A. F. Winn, who, among other of the Montreal collectors, has had the species long under notice, years ago coined the term "hydrcœcitis" for this appearance of the plants. Of his interesting observations he has seen the newly-emerged larva ascending the plants and drilling its way within the stem, and has drawn our attention to a parasitic wasp, which is an additional species as effecting this genus.

Ova were secured Sept. 6 from a pair confined in a roomy vivarium. They were deposited scatteringly without apparent design, singly or in small clusters. The egg is slightly flattened, the greatest diameter .6 mm., colour yellowish pearly-white. They winter over and emerge the latter part of May.

Stage I.—Generic characters fully evident, the dark middle joints, four to eight, are crossed by the continuous whitish dorsal line, the subdorsal being here discontinued; tubercles and setæ pronounced, the latter on abdominal joints one, two and three appear longer than the others; true legs black; spiracles ringed with black; head and shields shining yellowish.

Stage II.—Similar to preceding, the darkened portions become darker now, a deep purple-lake, the lines purer white. Tubercle IV becomes larger on abdominal joints.

Stage III.—As before; head and thoracic shield of equal width, polished, yellowish, a black line from the ocelli crosses the epicraneum obliquely to lower edge of shield, which is here bordered with black; tubercles blacker.

Stage IV.—Colours as before; the first pair of abdominal legs are still shorter, but now used; the blackish line on head and lower edge of shield finds continuation in the dark body colour existing as a stripe on

the thoracic joints between the white subdorsal and substigmatal lines; tubercle IVa now occurs on joint ten, at the upper corner of spiracle, is slightly larger than IV on this joint, but smaller than IV on the preceding one; I and II small on all joints to eleven.

Stage V.—Similar to preceding, colours intense, lines sharply defined, joints four, five, six and seven show as a solid girdle of blackish-purple, except where crossed by dorsal line. Tubercle IVa on joint ten as before.

Penultimate stage.—Similar, except the ground colour fades to a lighter shade; tubercles the same, IVa holding its corresponding size, and is without seta.

Mature larva; head normal, smooth, polished, now becomes brownish-yellow, side marking lost, though shield holds its conspicuous black edging; ocelli and mouth-parts touched with black; epicranial setæ normal, of about equal length, IV seeming longest, adfrontal area defined by nearly straight sutures; thoracic shield wide as head, long as joint one, smooth, shining, yellowish-brown; anal shield forms similar protection to joint twelve, but its surface is minutely roughened with granulations; tubercle IV is largest on first ten segments, exceeding the spiracle, on joint eleven III slightly exceeds IV, as do I and II, on joint ten IVa still holds the size of true IV lower down; all are brownish-black; spiracles dull black; crochets of prolegs similar to *harrisii*; body colour has now faded to whitish translucence, all lines lost; length of larva per stages, 6, 9, 12, 20, 26, 34, 42 mm. Larval period fifty to fifty-six days.

The boring is forsaken usually, and the pupal period, covering twenty-eight to thirty-six days, is passed in the ground or beneath some slight covering of refuse. The pupa is shining brown, the wing-cases well defined and thin enough that the stigmata are plainly seen shortly before emergence; abdominal joints taper evenly; a slight bifidate spur. Length, 18–22 mm.

Among the yellow-brown species of the genus of which it is a good type, *arctivorens* comes closest to the yellow, or type form of *harrisii*, both in larva and imago. Its individuality seems most pronounced in the white marking formed by the orbicular and claviform, being proportionately larger than with its allies, a feature especially accentuated in dwarfed or abnormal examples. There is no erratic variability as occurs with *harrisii*. The genitalia are of the usual pattern, showing no distinguishing features.

Papaipema rigida.

The list of food-plants can be increased to include *Helianthus tuberosus*, *Arctium lappa* and *Zizzia aurea*. The preferred food-plant, instead of *Helianthus decapetalus*, as stated by the writer in this magazine, Vol. XLI, p. 116, should be revised to *Heliopsis helianthoides*. The latter is by far most accepted, and seems very generally bored under favourable conditions. This plant does not occur at Rye, N. Y., and here *rigida* flourishes to some extent in the roots of *Zizzia*, which is not nearly so well suited for such a larva. The examples in *Arctium* were plainly cases of substitution.

An undescribed western species of *Hydræcia* has been referred to the writer, for which the following name is proposed :

Hydræcia repleta, n. sp..

Head and thorax clothed with admixture of yellow and reddish or garnet, hair-like scales, abdomen darker. Fore wings brown, of a nearly even shade, probably with red or garnet tinge when fresh ; basal area rather large, yellow, defined by a double inwardly-waved line at vein I, beyond this point an elongate white dot ; antemedial line double, filled in with yellow ; median shade faintly discernible, blackish ; orbicular large, round, white, with central speck of brown ; claviform rounded, white, bisected by brown hair line ; reniform large, a yellow bent bar surrounded by white spots divided by brown hair lines ; postmedial line double, ill-defined, illuminated near costa by yellow scales, bends outwardly past reniform, thence with ogee curve to inner margin ; subterminal line irregularly waved and generally parallel to postmedial ; postmedial area probably shows purplish-sheen when fresh ; terminal space faintly dashed with yellow between veins, and a yellow blotch at apex. Hind wings solid, dull black, with pale rufous fringes. Beneath the wings are smoky-black on a luteous ground, having a garnet suffusion at costal and terminal areas ; a black medial line and discal spots. Expanse, 34-36 mm.

Habitat.—Huachuca and Chiris Mts., Paradise, Ariz.; Aug. 21 to Sept. 13. Collector unknown.

Three specimens are at hand through the courtesy of Prof. J. B. Smith, who retains a male and female cotype.

The species is an exact counterpart in maculation of the fore wing of the well-known *serrata*, which seems common at Denver, Colo. The one male specimen is minus antennæ, so it cannot be stated if it has this pectinated as holds with its ally. The darker tone and black secondaries easily separate them, however, though the genitalia of the new form does not differ markedly from *serrata*, which has been figured by Prof. Smith.

NOTES ON THE BREEDING OF *TROPIDOPRIA CONICA* FABR.*

BY G. E. SANDERS, DIVISION OF ENTOMOLOGY, OTTAWA.

In carrying on some dipterous experiments in the Division, in August, 1910, many of the puparia of *Eristalis tenax* Linn. were found to contain the well-known parasite *Tropidopria conica*. About forty per cent. collected under natural conditions in August and September were found to be infested, giving on an average 35 adult parasites to each puparium. The highest number from one puparium was 46, and the lowest 21.

Emergence.—This takes place through one or more round, somewhat jagged holes, about 3 mm. in diameter, cut in the side of the puparium. The holes are cut by the adult after they have completed their transformations. All the parasites in one puparium appear to complete their transformations at the same time, showing no indication of a partial retarded development as is so often found in similar parasites.

Mating.—About three hours after emergence many pairs were seen together, apparently in coitu; closer examination, however, showed that

this was not the case. The male had placed himself firmly upon the dorsal surface of the female, and with his two front tarsi had caught hold of the antennæ of the female and drawn them upwards and backwards until they lay nearly perpendicular, one on each side, close to the fore part of his thorax. The antennæ of the male were thrown back so that the sense organ, or gland, situated on the fourth antennal joint, as shown in figure 2, lay directly against the antennal club of the female. This organ was being passed quickly up and down the female's antennal club, and was evidently intended to excite the female sexually; the wings of the male were raised and fluttered continuously during the process. Often

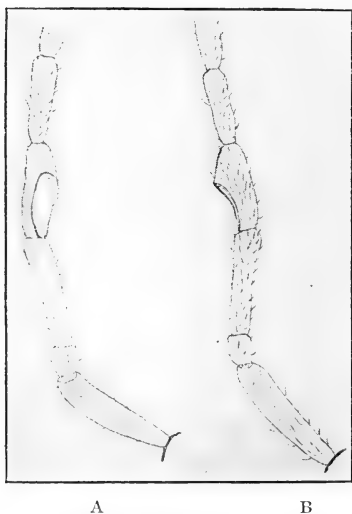


FIG. 2.—Proximal portions of antennæ of *Tropidopria conica* (x 45). A, right antenna; B, left antenna.

this means of excitement continued for three minutes, but more often it

*Scientific Contributions from the Division of Entomology, Ottawa.

February, 1911

lasted for from thirty to forty seconds. Copulation did not follow in all cases; in several cases it did. The exciting process appears to be always preliminary to copulation.

The gland-like organ is found on the fourth antennal joint of the male in *Tropidopria* and many allied genera, and it appears that its sole purpose is for the exciting of the female in the manner described.

Oviposition.—This takes place in the puparium. The earliest instance was observed forty-eight hours after emergence. The ovipositor is, in all cases, inserted directly back of the respiratory "horns" in the suture forming the cap, which is forced off by the *Eristalis* adult in emerging. Freshly-found puparia were selected, when possible, for oviposition in preference to those in which the host was well advanced. It was observed, however, that they would deposit their eggs in old puparia when only one is exposed. Several such cases, even when the female was known to be fertilized, did not harm the host, the adult *Eristalis* emerging. The ovipositor appears to be inserted by a straight slow thrust; the body of the female while ovipositing is raised in a semi-circle, except for an occasional movement of the antennæ, which for the most part are extended forward and rest upon the puparium. The time from the insertion to the withdrawal of the ovipositor was taken in four cases, being 173 minutes, 185 minutes, 96 minutes and 101 minutes respectively.

Development.—The larva is an internal feeder, developing and transforming within the soft tissues of the abdomen and thorax. In the early stages they do not retard the development of the host, as in instances where the puparia were known to be freshly formed when the eggs of the parasites were deposited in them, and when one of these was broken open fifteen days later the head, thorax and legs of the fly were found to be perfectly formed.

Length of cycle.—The two broods carried through from the egg to the adult took, in one case, 36 days, from August 7th to September 12th, and in the others 41 days, from September 7th to October 18th; in this last case the larval and egg stages were 30 days and the pupal 11 days. On account of the difficulty found in rearing the larvæ the cycle of the host could not be determined accurately. Data taken in the latter half of August and in September, when put together give the complete cycle at about 30 days—about 18 days larvæ and 12 days pupæ—in all a shorter cycle than that of the parasite.

The adult *Tropidopria* is particularly long-lived; in one lot, which emerged on September 21st, the majority lived until October 12th, and a few survived until October 14th.

Parthenogenesis.—Several pupæ were removed from one puparium and placed singly in gelatine capsules in order to secure unfertilized females. These, when they emerged, were placed on puparia which had been reared from larvæ, and were known to be free from parasites. On September 18th 9 adults, all males, emerged from one puparium.

Relative number of the sexes—Under natural conditions there is a great preponderance of females. From one phial containing several puparia, 298 parasites emerged; of these, 101 were males and 197 females. Two lots, each from one puparium, were examined, the one was found to contain 9 males and 35 females, the other 17 males and 29 females.

MELITÆA THEONA MENETRIES AND ITS SYNONYMY.

BY KARL R. COOLIDGE, PASADENA, CALIFORNIA.

Melitæa theona was described by Menetries in his *Enumeratio corporum animalium Musei imperialis Academiæ Scientiarum Petropolitaneæ*, 1855 (p. 86, and a figure, 5, on plate 2). Dr. Skinner has kindly sent me a copy of the original description, which reads as follows:

"444. *Melitæa theona* nob.—Encore une espèce de ce groupe américain de nos *artemis*, *athalia*, etc., dont on compte déjà plus d'une dizaine d'espèces. Sa taille est celle d'un petit individu de la *M. athalia* Esp., c'est-à-dire d'un pouce deux lignes d'envergure. Au premier abord, elle ressemble un peu à la *M. editha* Boisd. En dessus, les ailes sont d'un brun noirâtre, avec des bandes formées de taches jaunâtres et fauves, ainsi disposées: aux ailes supérieures, la bande la plus externe est composée de taches fauves, à l'exception de la 4e, qui est plus grande et d'un blanc jaunâtre; la seconde bande, qui est plus interne et plus irrégulière, est formée de 7 taches d'un blanc jaunâtre; plus près de la base, on remarque plusieurs taches fauves, séparées entr'elles par une tache d'un blanc jaunâtre, placée diagonalement au milieu de la cellule discoidale, puis une autre en dessous de cette cellule, plus poché de la base enfin une 3e allongée, dans la cellule et plus rapprochée encore de la base. Les ailes inférieures présentent une bande parallèle au bord externe, composée de 8 taches fauves, ces taches sont arrondies à leur sommet et tronquées inférieurement; le disque est coupé par une autre bande parallèle de 8

taches oblongues, également fauves ; et enfin, plus proche de la base, on compte 3 ou 4 taches peu distinctes. En dessous, les ailes supérieures offrent de plus, outre le dessin du dessus, une rangée de petites taches blanchâtres qui part du sommet et le long du bord externe ; la base est fauve, présentant les trois taches blanchâtres du dessus, entourées d'une ligne noire. Les ailes inférieures diffèrent du dessus, en ce qu'elles présentent de plus une bande de taches blanc-jaunâtres, le long du bord externe ; la bande qui traverse le disque de l'aile est formée de taches oblongues d'un blanc jaunâtre comme en dessus, mais bordées de noir inférieurement et d'un simple liséré de cette teinte antérieurement ; la base présente une bande de taches, en rayons, étroites, surtout les plus internes, d'un blanc jaunâtre, un autre plus bas au milieu, le tout reposant sur un fond fauve." The type locality is given as Nicaragua.

Edwards, in 1870 (Trans. Ent. Soc. Phila., Vol. 3, p. 191), described *M. thekla*, "taken by Dr. E. Swart in So. Calif.," and which has since been found to occur commonly in Arizona and Texas. I know of no definite locality for *thekla* in California, and Mr. W. G. Wright (Butt. West Coast) has apparently never met with it in this State. *Bollii* Edwards was published in Field and Forest, Vol. 3, p. 101, 1877, and is a synonym of *thekla*, as Dr. Holland, who possesses the types of both, has pointed out. Dr. Scudder, in his Synonymic List of the Butterflies of North America, Bull. Buff. Soc. Nat. Sciences, Vol. II, p. 265, 1875, gives for the habitat of *theona*, which with *leanira* and *thekla*, he places in his genus *Thessalia*, "So. Cal., Nicaragua and Guatemala." Boisduval, in the classic Lepidoptères de la California, p. 55, 1869, says of *theona* that "Cette espèce très commune dans certaines localités du Mexique, a été retrouvée dans la Sonora par M. Lorquin." Sonora evidently is referable to Southern California. I have long suspected that our *M. thekla* is a pure synonym of *theona*. Certainly the description of *theona* is applicable to either *thekla* or *bollii*, and furthermore, Godman and Salvin, in the Biologica Cent. Americana, state that specimens of *bollii* and *thekla* from northern Sonora are not distinguishable from *theona*, except in being somewhat more fulvous. It is quite obvious then that *thekla* and *bollii* must be relegated to the synonymy of *theona*, which has long priority. It is a matter of astonishment that this group should have stood erroneously so long in our lists. Dr. Skinner (Cat. Rhop.) does not include *theona* in our fauna, but later in his first supplement (p. 9) he lists *theona* var.

perlula Felder (Wien. Ent. Mon., 5, p. 104, n. 80, 1861), which Doll. Ent. News, Vol. 15, p. 350, 1904, reports from Brownsville, Texas. I am totally unacquainted with this, but believe that it is another *theona* synonym, or that the identification is incorrect, as *perlula* is not known to occur in the intermediate region between Texas and Venezuela. The Biologica makes no mention of it. Dr. Dyar, Bull. 52, U. S. Nat. Museum, includes *theona*, and gives it the habitat "Texas, Colorado," placing *fulvia* Edwards' as a synonym. This is certainly incorrect, as *fulvia* is a synonym of *alma* Strecker. Strecker, Cat., p. 126, 1878, records *theona*, No. 231, from S. California, S.-West Texas, Cent. America. Dr. Smith's Catalogue gives *theona* (No. 110), and places it between *wrightii* and *thekla*. The synonymy is as follows:

Melitæa theona Menetries.

syn. *thekla* Edwards.

bollii Edwards.

M. definata Aaron belongs in this group, and may be the insect recorded as *perlulu*.

The Department of Zoology and Entomology of the Ohio State University has recently received as a donation a fine collection of Lepidoptera from Mrs. Catharine Tallant, of Richmond, Indiana. The collection was made by Mr. W. N. Tallant during a series of years in the nineties and up to about 1905. It contains mainly species occurring in central Ohio, especially at Columbus, but has also a number of species from different parts of the United States, and also some fine samples of species occurring in South America, Japan, China, India, Ceylon and Africa. The collection contains about 10,000 specimens in most excellent condition, very beautifully mounted, and many of the species contain very full series, showing variations, etc., which will make them of special value for scientific study. They are, for the most part, carefully identified, included in good cases and cabinets, and will be kept under the name of the "Tallant Collection."

Taken with the other collections in Lepidoptera, the collection of Odonata left by Professor Kellicott, and those in various groups which have been accumulated by the efforts of the members of the Department, the University is now provided with an excellent collection of insects, including representatives in all the different orders, the total number of specimens probably coming close to 100,000.

HERBERT OSBORN, Columbus, O.

NOTES ON DIABROTICA AND DESCRIPTIONS OF NEW SPECIES.

BY FRED. C. BOWDITCH, BROOKLINE, MASS.

(Continued from page 16.)

D. peckii, nov. sp.

Yellow; head, intermediate joints of the antennæ, scutel, pectus, tibiæ and tarsi black; elytra smooth, shining yellow, each with a large quadrate black patch at the base and a large circular black spot at the apex, in the middle of each a round yellow spot. Length, $5\frac{1}{2}$ mm.

One example, Manatee Dist., Brit. Honduras, Dec. 6, 1909. Collected by Mr. Peck.

Head with fovea small and abrupt; antennæ a little more than half the length of the body, joint 2 short, 3 one-half longer, 4 equal to two preceding; 1 and 9-10 and base of 11 pale yellow, 2-3 cloudy, the rest dark. Thorax pale flavous, smooth impunctate, faintly depressed behind and at the middle, and obsoletely bifoveate; elytra very slightly dilated behind, smooth, shining, faintly and finely punctulate, longitudinally sulcate, when looked at from behind at a certain angle obsoletely, the basal black patches join at the suture, each is convex towards the apex and reaches nearly the middle of the elytra, but does not attain the lateral edge; the apical patch oblong circular, nowhere attaining the edge or suture.

Very close to *bioculata* Bow., but with three, in place of two, upper joints of the antennæ light, thorax wider and more indefinitely foveate, elytra much more sparsely punctured, and colour of markings dull black in place of blue or cyaneous.

D. columbiensis, nov. sp.

Head, tibiæ and tarsi black, antennæ more than half the length of the body, joints 1-3 and 9-10 flavous, rest piceous, thorax rufous (like *varicornis* Jac.), deeply bifoveate, and sometimes an indication of a third just before the scutel, which is piceous; elytra yellow, strongly plicate, with a blue-black annulus at the base (often broken), and a curved fascia behind the middle, not attaining either edge (often broken); between these blue marks is a suffused rufous-orange band, and the tip is the same colour, abdomen and femora yellow. Length, 5-6 mm.

Type Columbia, also Ibague, Columbia (Fr. Claver) 4 var., Calif., Columbia (Rosenburg), (Venezuela, Mocquerys?).

Very close to *varicornis* Jac. and *Haroldi* Baly; from the former it differs by the black tibiæ and tarsi and different colouring, from the latter by the narrower rufous thorax and different colouring, and from both by the shorter second and third joints of the antennæ, which are short and equal; fourth much longer in ♂ and somewhat longer in the ♀; thorax a little longer than wide, lightly sinuate at the side; elytra slightly dilated behind; what I regard as the typical form has the basal ring-shaped mark, complete, contiguous at the suture, but not attaining the margin and without any projection at the outside rear, similar to what is found in *tibialis* and *adelpa*, the rear fascia is broken into broad spots, the general effect being rather orange-coloured, elytra with dark spots, surrounded with a lighter colour, after the manner of certain specimens of *Clarkella* Baly; abdomen and femora yellow. Two of the Cali examples have light piceous legs (immature?). In its elytral markings the variety, when the spots are broken, much resembles *semicirculata* Jac. from Bugaba.

D. chimborensis, nov. sp.

Head, scutellum, pectus, and tibiæ and tarsi black, antennæ piceous, flavous at base, joints 9-10 white, thorax a little longer than broad, rufous, shining, sparsely, finely, but evidently punctured, elytra pale yellowish-white, with a vivid cyaneous or bluish band at the base not attaining the margin (enclosing a round yellow spot) and an oblique fascia of the same colour behind the middle, femora and abdomen yellow, the former tinged with piceous at the apex. Length, $6\frac{1}{2}$ mm.

Type, one example "above Chimbo., 3000 viii, '97, Rosenberg."

Very like *tibialis* Jac., or *adelpa* Har.; frontal fovea not very deep, antennæ a little more than one-half as long as body, the first joint pale, with piceous tip, joint 2 short, 3 one-half longer, piceous with pale bases, 4 almost one-half longer than the two preceding, joints 4-8 black, 9-10 and base of 11 white, thorax comparatively longer and narrower than *tibialis* and punctured, the forward band of the elytra, with its enclosed spots, is the same marking as *tibialis* and *adelpa*, but cyaneous in place of black; the posterior fascia is almost straight-edged, oblique and not right-angled or semilunate, as in the *tibialis* and *adelpa*. The form is moderately dilated to the rear, and the elytra are not plicate.

I have two examples from Caracas, Venez., which I include with this species, one of which was labelled as *tibialis* Jac. in his second collection.

D. purpurascens, nov. sp.

Head flavous, vertex and front tinged with purple, labrum black, antennæ fuscous, flavous at base and apex, thorax as long as broad, smooth, convex, impunctate, light piceous purple; elytra plicate, orange, with three basal spots, a common scutellar, and a humeral, and two transverse bands, one before and the other behind the middle dark piceous purple, and the lateral and sutural margins lighter purple, beneath and tibiæ and tarsi light piceous purple, femora flavous. Length, 6 mm.

Two examples, olive-green label (Pachitea). Peru.

Antennæ three-fourths the length of the body, fuscous, lighter at the base, joint 9 white (10-11 missing), joints 2 and 3 almost equal in length, 4 much longer than the two preceding, the thorax in certain angles shows obsolete depressions where the usual foveæ are, sides very lightly sinuate; elytra moderately dilated to the rear, strongly plicate, thickly and strongly punctured; neither of the transverse fasciæ attain either the margin or suture, the anterior one, however, joins the humeral patch at the side, the sutural purple begins just behind the scutellar spot, the general colour beneath is light piceous-purplish with flavous femora. The purple colouring is probably much brighter in fresh specimens; seems to belong near *δ-pustulata* Baly.

D. argo, nov. sp.

Head black, antennæ black, base of the first and joints 8, 9, 10 and extreme base of 11 pale, thorax yellow, smooth, transverse, depressed, obsoletely trifoveate, scutel black; elytra nearly parallel, not plicate, punctured, yellow, a basal band and a curved fascia behind the middle, cyaneous, ♂ with a tubercle near the suture in the curved fascia, body below yellow, pectus black, legs yellow, tibiæ and tarsi black. Length, $6\frac{1}{2}$ mm.

One ♂, Cali, Columbia, ix, xii, '94 (W. Rosenberg). One ♂, 2 ♀'s, Pischindé, Columbia (Rosenberg).

The antennæ are about three-fourths the length of the body, joint 2 short, 3 nearly twice as long, 4 longer than both preceding united (♂), in the ♀ joint 3 is relatively a little longer; the thorax is much broader than long, sinuate at the sides behind, impunctate, shining, broadly depressed; the scutel is polished convex; the punctuation of the elytra is obsolete at the rear, but coarse and confluent anteriorly, the anterior cyaneous band occupies about quarter of the length, and except for the extreme inflexed edge of the elytra is entire, the rear fascia is about half the width of the

anterior band and convex anteriorly, the ♂ tubercle is on the forward edge. This species is, so far as I am aware, the only one in §1 where the ♂ has a sutural tubercle. It is of course nearly allied to those forms in the Baly-Gahan paper covering §2 "C."

D. songoensis, nov. sp.

Head black, antennæ, thorax, scutel and legs flavous, thorax bifoveate, elytra plicate, strongly punctate, pale flavous, with three basal spots, one common, wedge-shaped sutural, the other oblong humeral, and an oblique patch on the convexity behind the middle, and equidistant from the margin and suture, all vivid cyaneous blue. Length, 5 mm.

One example, Songo, Bolivia.

The mouth-parts are yellow, frontal fovea very large and round, antennæ longer than half the body, joints 2-3 short, the latter one-half longer than the former, 4 equal to the two preceding; thorax about as long as broad, sides moderately sinuate, surface smooth, deeply bifoveate and depressed at rear; the elytra are slightly dilated behind, and the punctuation, especially forward, is comparatively coarse, the plication is not strong, and the suture is slightly depressed behind the scutel, the humeral blue marks are truncate at the rear. Comes near *5-maculata* Fabr.

D. klagii, nov. sp.

Head piceous brown, antennæ fuscous, prasinous at the base, thorax prasinous, convex, shining, impunctate, scutel flavous, elytra flavous, plicate, lateral edge prasinous, a common elongate sutural, a humeral, a median discal and a large apical blotch, chocolate-brown; body beneath and legs flavous, with the under part of the thorax, the antepectus and femora prasinous. Length, 6 mm.

One example (♂), St. Catharine, Brazil (Klages).

This species has superficially the appearance of *11-punctata* Jac. The antennæ are a little more than half the length of the body, joints 2-3 short and of equal length, the third obconic and stout after the manner of the forms near *simulata* Baly, fourth joint slightly longer than the two preceding (or the longest of all); the joints 4-10 are somewhat thickened and dilated so they appear stout, the thorax is very sinuate behind; the plication of the elytra is strong and about two or three sulcations indicated between it and the suture, the depression behind the scutel is narrow but well marked, and the punctuation is fine and even. I place it next *11-punctata* Jac., from which it is at once separated by the smooth thorax and incrassate antennæ.

D. septemplagiata nov. sp.

Head prasinous, with black labrum and piceous vertex, the fovea on top, very large and well marked; antennæ black, prasinous at base, tenth joint white; thorax prasinous, convex, shining, sparsely but distinctly punctured, and with three obsolete foveæ, scutel black; elytra prasinous, plicate, punctured, the disk longitudinally, obsoletely yellow from the base to near the apex, two spots at the base of each elytron, one common wedge-shaped sutural, the other small humeral; also two small round discal spots, one about the middle and the other directly behind on the convexity, all black; body below and legs yellow prasinous, tibiæ and tarsi black. Length, 7 mm.

One ♂ example, S. Catharine (Lüderwoldt).

Antennæ filiform, about three-quarters the length of the body, joint 2 short, 3 a trifle longer, 4 longer than both together, 9-10 white, base of 11 more or less white; the sides of the thorax are much rounded in front of the middle and nearly straight behind; the elytra are moderately dilated behind, shiny, thickly and strongly punctured, even a little confluent, along the suture forward; the depression back of the scutel is distinct but not noticeably great; the four round black spots on the disk, two on each side, are placed on a yellowish-green ground, so as to form the corners of a square, :, and are the most noticeable thing about the species.

D. delrio, nov. sp.

Head prasinous, with piceous labrum and mouth, and black eyes; antennæ fuscous, prasinous at base; thorax prasinous, convex, shiny, impunctate, scutel piceous; elytra prasinous, plicate, with three flavous spots, the first basal, median, elongate, a trifle more than one-third the elytral length, the second submedian, transverse, slightly oblique, and a little nearer the suture than the margin, the third apical, round, equidistant from the suture and margin; below and legs flavous, with the thorax prasinous and tibia tinged with prasinous. Length, 5 mm.

One ♂ (?), Rio de Janeiro.

Antennæ about three-fourths length of body, joint 2 short, 3 scarcely one-half longer, 4 longer than the two preceding, thorax a trifle broader than longer, very slightly sinuate, elytra barely dilated behind, with one or two sulcations indicated on the disk of the elytra, punctuation fine and rather sparse. Among the green species this will come near *selecta* Jac. and *glaucina* Baly, but these, however, have the basal yellow spot humeral, here it is strictly median, and does not encroach on the humeral knob.

D. rosenbergi, nov. sp.

Head dark piceous, antennæ nearly as long as body, fuscous, with three upper joints flavous, thorax dark olivaceous, rather opaque, bifoveate, scutel piceous, elytra castaneous, with prasinous suture and margin, vanishing before the apex, and one or more cross bands of the same, indicated before and behind the middle; body beneath flavous, with piceous breast, legs with prasinous femora, and piceous tibiæ and tarsi. Length, 6-7 mm.

Three examples, two ♀'s, one ♂, R. Dagua, Columbia, Rosenberg.

This comes near *6-maculata* Baly, and also *curvipustulata* Baly, but differs in colour of the head, and the last *three* joints of the antennæ being pale, the elytra also are not spotted but wholly suffused, though I assume a larger series might show distinct spots. My ♂ has the antennæ nearly as long as the body, joints 2-3 short and equal, the latter, however, more obconic in shape, 4 nearly twice as long as both preceding, and easily the longest joint of all, three upper joints pale flavous, the extreme tip of the last piceous, the thorax and elytra are entirely castaneous (faded?) with a touch of piceous on the suture, the shoulders, and in the disk before and behind the middle; the punctuation of the elytra is thick and moderately coarse, and there are several indistinct sulcations on the disk.

D. rufopustulata, nov. sp.

Head prasinous, mouth piceous, antennæ prasinous, becoming fuscous at middle and end, thorax shining prasinous, deeply bifoveate, scutel piceous, elytra prasinous, almost parallel, depressed, strongly plicate, and punctured, each side with a bright rufous, round spot on the disk in front of the middle, and rather distant from the suture, also an indistinct rufous spot near the apex on the convexity, legs prasinous, tarsi and apex of tibia piceous, abdomen yellow, pectus black. Length, $4\frac{1}{2}$ mm.

One (♀?) example, La Paz (Bolivia?), green label.

Antennæ about half length of body, joints 2-3 short and equal, 4 equal the two preceding, basal joint prasinous, then the colour gradually grades up to the eleventh joint, which is dark fuscous and the darkest of all, thorax is rather longer than broad, and nearly parallel, and the fovea large and deep, elytra rather dull, with the thick punctuation, flat, also depressed along the suture, the plication below the shoulder very strong and deep. The noticeable thing about the species is the rufous anterior spot, which is easily visible, and at once distinguishes this species.

(To be continued.)

TWO NEW GENERA AND SEVEN NEW SPECIES OF THE FAMILY APHIDIDÆ.

BY H. F. WILSON, OREGON AGRICULTURAL COLLEGE.

Amphorophora howardii, n. sp.

This species is dedicated to Dr. L. O. Howard, Chief of the U. S. Bureau of Entomology, who has in the past two years extended me many favours whereby I have been able to carry on my aphid studies with much benefit to myself.

Alate viviparous female.—General colour light brown; antennæ, head, thorax and legs black. Abdomen light brown, robust, and with a row of dusky transverse dorsally placed spots. Wings long, broad, and with the cubitus twice forked. Nectaries about one-fourth the length of the body, vasiform. Cauda ensiform, one-half the length of the nectaries; anal plate rounded; tip of abdomen and cauda with short bristles.

Antennæ with six segments and placed on prominent antennal tubercles. Spur of sixth longer than the third segment, and about five times as long as the sixth.

Measurements.—Length of body, 1.9 mm.; width, .9 mm.; length of antennæ by segments, I, .10 mm.; II, .05 mm.; III, .45 mm.; IV, .3 mm.; V, .33 mm.; VI, .15 mm.; spur of sixth, .7 mm.; total length, 2.98 mm.; length of wing, 3 mm.; total expanse, 6.5 mm.; nectaries, .41 mm.; cauda, .23 mm.

Apterous viviparous female.—General colour light brown, antennæ slightly longer than the body, and placed on more or less prominent tubercles; colour darker brown. Abdomen robust, each side with seven or eight dorsally placed black spots. Nectaries about one-fourth the length of the body and strongly vasiform; cauda ensiform.

Measurements.—Length of body, 1.75 mm.; width, .85 mm. Length of antennæ by segments, I, .10 mm.; II, .05 mm.; III, .4 mm.; IV, .29 mm.; V, .32 mm.; VI, .12 mm.; spur of sixth segment, .68 mm.; nectaries, .46 mm.; cauda, .22 mm.

This species was fairly abundant throughout the summer on the heads of *Panicularia nervata* among streams and in swampy ground about Batesburg, S. C.

Aphis sassceri, n. sp.

This species was sent to me by Mr. E. R. Sasscer, from Miami, Fla., where he collected it in the Subtropical Gardens from *Anona rectilinata*. Specimens were sent to me alive, and received June 2, 1910.

Alate viviparous female.—General colour orange-yellow, antennæ, thorax, distal ends of tibiæ, nectaries and tip of cauda dusky; wings hyaline. Antennæ with six segments, shorter than the body and not placed on antennal tubercles. Spur of sixth segment longer than any one segment, and about three times as long as the sixth; 5 slightly shorter than 4, and 3 and 4 about equal in length; third segment with four to six large round sensoria, fifth with one large sensorium near the distal end; first segment slightly gibbous at the upper inner angle. Head broad and nearly flat, slightly elevated at the inner base of each antennæ. Wings long and broad, veins hyaline. Abdomen robust, nectaries tapering and bent outward at the tip. Cauda two-thirds the length of the nectaries and knobbed at the end. Anal plate broadly rounded, tip of cauda and anal plate with a number of prominent hair-like bristles. Abdomen with a row of three black spots on each side, and also with a number of dentate tubercles in a line along each side.

Measurements.—Length of body, 1.05 mm.; width, 0.45 mm.; antennal segments, I, 0.05 mm.; II, .04 mm.; III, .17 mm.; IV, .14 mm.; V, .13 mm.; VI, .08 mm.; spur, .26 mm.; total length, .87 mm. Length of wing, 1.5 mm.; width, .56 mm.; total expansion, 3.82 mm. Length of nectaries, .12 mm.; length of cauda, .06 mm.

Apterous viviparous female.—General colour greenish-brown; antennæ, tarsi, tips of tibiæ, and nectaries dusky. Antennæ six-segmented, nearly as long as the body and not on antennal tubercles. Antennal segments compare as in alate form. Body short and stout, nectaries tapering and curved outward. Cauda broad, short and pointed. Abdomen with a row of five or six dentate tubercles along each side.

Measurements.—Length of body, 1 mm.; width, .56 mm. Length of antennal segments, I, .05 mm.; II, .04 mm.; III, .22 mm.; IV, .14 mm.; V, .14 mm.; VI, .09 mm.; spur, .22 mm.; total length, .9 mm.; nectaries, .10 mm.; cauda, .06 mm.

Aphia minuta, n. sp.

Collected on Aero potato, Bureau of Plant Introduction greenhouses at Washington, D. C. The plant belongs to the morning-glory family.

Alate viviparous female.—General colour yellowish-green, antennæ, tarsi, tips of femora and tibiæ, and nectaries dusky. Antennæ with six segments, not set on antennal tubercles, and as long as the body. Third segment the longest, but the spur of the sixth is longer than the third and

fourth segments together, and about five times as long as the sixth; fourth shorter than the fifth; third with two to five large round sensoria. Nectaries thick, about as long as the tarsi and tapering. Cauda large and slightly longer than the nectaries.

Measurements.—Length of body, 0.47 mm.; width, 0.18 mm. Length of antennæ by segments, I, .026 mm.; II, .026 mm.; III, .09 mm.; IV, .52 mm.; V, .06 mm.; VI, .05 mm.; spur, .19 mm.; length of wing, .97 mm.; total expanse, 2.1 mm.; length of nectaries, .08 mm.; cauda, .06 mm.

Apterous viviparous female.—General colour yellowish-green, tips of antennæ, tarsi and nectaries dusky. Body oboval and almost as broad as long. Antennæ as long as the body, with six segments and not placed on antennal tubercles; third segment the longest, but spur of sixth as long as the third and fourth together. Fifth segment with one large sensorium near the distal end. Nectaries twice as long as the tarsi, thick and tapering. Cauda two-thirds as long as the nectaries, broad and with a semi-knobbed tip. Anal plate very short and broadly rounded. Cauda and plate with few long hair-like bristles.

Measurements.—Length of body, .59 mm.; width, .47 mm. Length of antennal segments, I, .03 mm.; II, .026 mm.; III, .11 mm.; IV, .10 mm.; V, .06 mm.; VI, .052 mm.; spur, .19 mm.; nectaries, .08 mm.; cauda, .06 mm.

Carolinaia, n. gen.

This genus is closely related to *Cerosipha* in that the alate forms have six segments in the antennæ, while the apterous forms have but five. Antennæ shorter than the body, and not placed on antennal tubercles. Venation of fore wing regular, hind wings with but a single cross-vein. Nectaries about one-fifth the length of the body, and swollen in the middle. Cauda one-fourth the length of the nectaries and tapering.

Carolinaia caricis, n. sp.

Alate viviparous female.—General colour greenish-yellow, head and thorax black, antennæ, legs and nectaries dusky yellow. Antennæ shorter than the body, six-segmented and not on antennal tubercles. Sixth antennal segment slightly shorter than the spur, and about half as long as the third segment. Third with seven to eight round slightly raised sensoria. Wings long and slender, fore wing with regular venation, hind wing with but a single cross-vein. Nectaries one-fifth the length of the body and swollen in the middle. Cauda very short and tapering.

Measurements.—Length of body, 1.55 mm.; width, .67 mm. Length of antennal segments, I, .045 mm.; II, .066 mm.; III, .3 mm.; IV, .13 mm.; V, .12 mm.; VI, .13 mm.; spur, .22 mm. Length of wing, 1.86 mm.; total wing expansion, 4.17 mm.; length of nectaries, .59 mm.; cauda, .09 mm.

Apterous viviparous female.—General colour greenish-yellow, tinged with brown. Body quite flat, slightly rounded above, cauda slightly darkened at the tip. Antennæ less than one-half the length of the body, and with but five segments, spur of the fifth slightly longer than the segment. Nectaries one-fourth the length of the body, and swollen in the middle. Cauda short and triangular.

Measurements.—Length of body, 1.55 mm.; width, 1 mm. Length of antennal segments, I, .045 mm.; II, .045 mm.; III, .18 mm.; IV, .066 mm.; V, .066 mm.; spur, .135 mm.; length of nectaries, .58 mm.; cauda, .09 mm.

Specimens collected on seed pack of *Carex* sp.; quite numerous in swamps, with two to ten specimens on a plant. Batesburg, S. C., summer of 1910.

Pergandeida nigra, n. sp.

Alate viviparous female.—General colour grayish-black, antennæ, except segments one and two, and tibia and tarsi yellowish. Wings hyaline, veins dusky. Antennæ shorter than the body, six-segmented and not on antennal tubercles. Segments three to six and spur slender, one and two stout. Spur of sixth segment longer than third segment, third with four to seven large round sensoria more or less regularly placed. Head with a prominent frontal ocellus and raised at the inner base of each antennæ. Prothorax with a single dentate projection on each side. Abdomen also with a single protuberance on each side close to those of the thorax. Wings long and robust, with the second fork of the median vein running close to the edge of the wing. Abdomen robust, and with a number of protuberances on each side. Nectaries twice as long as broad and tapering. Caudal plate broad and tapering.

Measurements.—Length of body, .89 mm.; width, .39 mm. Length of antennal segments, I, .039 mm.; II, .039 mm.; III, .15 mm.; IV, .104 mm.; V, .09 mm.; VI, .065 mm.; spur, .26 mm.; nectaries, .065 mm.; cauda, .07 mm.

Apterous viviparous female.—General colour grayish-black, segments three to six of antennæ, tibia and tarsi yellowish. Antennæ shorter than the body and without antennal tubercles. The lateral projections of the body are very distinct, there being three sets of large and three sets of small protuberances, the first set placed just behind the eyes, the second midway on the abdomen, and a third large pair between the base of the nectaries and the cauda. Nectaries about twice as long as wide and tapering; cauda short and thick.

Measurements.—Length of body, .79 mm.; width, .49 mm. Length of antennal segments, I, .04 mm.; II, .03 mm.; III, .12 mm.; IV, .08 mm.; V, .09 mm.; VI, .065 mm.; spur, .235 mm.; length of nectaries, .05 mm.; cauda, .08 mm.

Collected from *Cyrilla racemiflora* at Batesburg, S. C., during the summer of 1910.

Anæcia Enotheræ, n. sp.

Alate viviparous female.—General colour yellowish-green, antennæ, head, thorax and legs dusky to black. Antennæ about one-third the length of the body, with six segments, the sixth bearing a short thumb-like spur. Antennal tubercles wanting. Spur of sixth segment about one-fourth the length of the segment, the segment being slightly longer than five, and about one-half as long as three. Five slightly longer than four, and four not much longer than one or two. Third segment with three or four widely-separated sensoria, which are not as prominent as those in other species of *Anæcia*. Fourth with one or two near the distal end. Fifth with one large sensorium near the distal end and sixth with one large and several small sensoria at the base of the spur. Head broadly rounded, body short and robust, wings short and broad. Wing-veins not heavy, fore wing with two oblique veins and cubitus once forked. Abdomen yellowish, with five dorsal stripes distally placed, and a row of six or seven black spots, one each side. Nectaries are but flanged edges on a slightly raised base. Cauda broadly rounded and broader than long. Anal plate broadly rounded and merged into the abdomen. Antennæ, legs, cauda and tip of abdomen with numerous fine hairs.

Measurements.—Length of body, 1.66 mm.; width, .76 mm. Length of antennal segments, I, .04 mm.; II, .05 mm.; III, .18 mm.; IV, .065 mm.; V, .09 mm.; VI, .078 mm.; spur, .03 mm.; length of wing, 1.89 mm.; total expansion, 4.0 mm.; length of nectaries, .04 mm.; cauda, .15 mm.

Apterous viviparous female.—General colour yellow, tips of the antennæ, tibia and tarsi dusky. Antennæ six-segmented and not on antennal tubercles. Spur of sixth segment one-third as long as segment, fifth and sixth equal; four shorter than five, and third as long as the fourth, fifth and sixth together; eyes undeveloped, nectaries as in alate form. Cauda and end of abdomen a little more pointed. Abdomen with three or four dorsal stripes. Antennæ, legs and body with numerous fine hairs.

Measurements.—Length of body, 1.68 mm.; width, 1.09 mm. Length of antennal segments, I, .05 mm.; II, .05 mm.; III, .18 mm.; IV, .052 mm.; V, .065 mm.; VI, .065 mm.; spur, .03 mm.; length of nectaries, .04 mm.; cauda, .19 mm.

This species was very abundant in the cotton fields on the roots of *Cenothera* sp. up to the time that the migration commenced, about the first of May. After the last of May very few specimens were to be found. A search was made for the summer host-plant, but without success. The first winged specimens were taken May 2, 1910.

Georgia, n. gen.

This genus is probably closely related to both *Schizoneura* and *Pemphigus*, and may prove to be the dividing genus. The wings are veined, as are those of the species which belong in *Schizoneura*, while the antennæ are similar to those species belonging in the *Pemphigus* group. The stem mother has five segmented antennæ, with a very short spur. Antennæ of the alate females with six segments and a short spur, segments three to five being more or less corrugated on the outer side, the corrugations being rudimentary sensoria. Front pair of wings with the cubital vein once forked. Hind wing with but a single oblique vein, which is sometimes forked about a third of the way from its base.

Georgia ulmi, n. sp.

Apterous stem mother.—General colour reddish-brown; head short and dished, body oboval in shape. Antennæ short and with five segments, the spur of the fifth being very short; third longer than the fourth, fifth and spur; eyes small and apparently simple. Nectaries are but pores, cauda very short and broadly rounded.

Measurements.—Length of body, 1.5 mm.; width, 1.17 mm. Length of antennal segments, I, .04 mm.; II, .056 mm.; III, .15 mm.; IV, .07 mm.; V, .042 mm.; spur, .021 mm.

Alate viviparous female.—General colour reddish-brown, head and thorax black, the third segment of the antennæ and the femur of each leg dusky, the remaining segments of the antennæ and the other parts of the legs are greenish-yellow. Antennæ about one-third the length of the body and not on antennal tubercles. Spur very short. Third segment as long as the fourth, fifth and sixth together, and with nine to ten transverse rudimentary sensoria or elevations along the outer side. Fourth with four to six, and the fifth with three to five toward the distal end. Forehead slightly dished, body elongate, wings hyaline, with veins slender and dusky. Fore wing with venation as in *Schizoneura*, hind wing with one oblique vein, which is sometimes forked. Nectaries are but pores, with a slightly thickened edge. Cauda triangular and short. Body with a row of small pores along each side of the abdomen, about six in number.

Measurements.—Length of body, 1.85 mm.; width, .94 mm.; length of wing, 2.4 mm.; width, 1.88 mm.; total expansion, 4.6 mm.; antennal segments, I, .056 mm.; II, .056 mm.; III, .33 mm.; IV, .11 mm.; V, .084 mm.; VI, .07 mm.; spur, .014 mm.

The pseudo-gall formed by this species is made on one edge of the leaf, and is spindle-shaped in form, being about one-fourth of an inch in diameter, and from one to two inches in length. When first formed the leaves turn yellow, and then red, after which they drop off.

Collected at Batesburg, S. C., spring of 1910.

The second generation is winged, and migrate from elm during the early summer.

THECLA CHRYSALUS, EDWARDS, AND ITS VARIETY CITIMA, HENRY EDWARDS.

BY WM. PHILLIPS COMSTOCK, NEWARK, N. J.

On pages 374 and 375 of the November issue of the CANADIAN ENTOMOLOGIST, Mr. Karl R. Coolidge says: "I can see no need of retaining *citima* Hy. Edwards in our catalogues as a variety of *chrysalus*, since it is only an individual variant." Having in my collection a very fine series of *Thecla chrysalus*, I feel called upon to answer this remark.

From a variation series of ten males and ten females which were selected from more than twice this number of specimens, I feel confident that *citima* may be held as a good varietal name for a geographical form of *Thecla chrysalus*. In many specimens the orange markings of the upper side are completely wanting, and the ground colour of the under

side is of decidedly lighter tone, which is in accordance with the original description of *citima* (Papilio I, 53), and with the type specimens in the Henry Edwards collection, with which I am familiar.

My observations of this insect lead me to believe that in the south (New Mexico and Arizona) type *chrysalus* is found predominant with the rich orange markings, while in the north (Utah), whence I have a good series of specimens, the orange markings are aborted and in many specimens entirely wanting. I think the form designated as *citima* as worthy of a varietal name as many other colour varieties of the butterflies.

In the Colorado specimens it is, moreover, not unusual to find the black patch midway of the wing on the costa entirely wanting, and also the black scales along the costa reduced to a very fine band, thus leaving the entire disc of the primaries purple. Another interesting variation is a tendency in some female specimens to have yellow spots replacing the orange found in the type *chrysalus*.

"A DECISION ON MEIGEN'S 1800 PAPER."

BY D. W. COQUILLETT, WASHINGTON, D. C.

In concluding the article under the above heading, which appeared in the January number of the CANADIAN ENTOMOLOGIST, the statement is made that "the Commission did not only not decide against my contention," (*i. e.*, that the Meigen names of 1800 are *nomina nuda*), "but that the Secretary expressly says that the essential feature of the case does not lie within the jurisdiction of the Commission."

This is an extraordinary deduction, in view of the fact that in the portion of the decision quoted it is stated that "the Commission is of the opinion that the generic names in Meigen's Nouvelle Classification, 1800, must take precedence over those in his Versuch, 1803, in every case where the former are valid under the International Code."

Thus the names of 1800 are placed on the same footing as those of 1803, otherwise they could not take precedence over the latter. The status of the names of 1803 has never been questioned.

It must be borne in mind that the Commission applies the term *valid* only to the oldest available names of the various genera, not to synonyms or homonyms. In view of this fact, the statement of Dr. Stiles, that the question of the *validity* of the names rests with the specialist, becomes perfectly plain. None but a specialist could unravel the synonymy in a given group.

February, 1911

THE LITHOBIOMORPHA OF COLORADO.

RALPH V. CHAMBERLIN, BRIGHAM YOUNG UNIVERSITY, PROVO, UTAH.

The records given in the present paper are based upon a study of collections made by Prof. T. D. A. Cockerell, chiefly in Boulder Co., and by the author during brief periods spent near Glenwood Springs (1904) and at Colorado Springs and Manitou (1910). The list is necessarily but partial, and when collecting for Myriapoda has been done in other sections the number of species will undoubtedly be considerably increased.

Family *Henicopidae*.

In addition to the *Lamyctes* listed below, another member of the family will in all probability be found at upper elevations in the Colorado Mts. This is *Zygethobius dolichopus* Chamb., which has been found by the author in the Uintah Mts., as well as in the Wahsatch and Sierra Nevada Ranges. It may readily be distinguished from the *Lamyctes* by its larger size, by having the posterior angles of the ninth, eleventh and thirteenth dorsal plates produced, whereas they are straight in the *Lamyctes*, and by having the tarsi all biarticulate instead of those of the first thirteen pairs being undivided.

Lamyctes fulvicornis Meinert.

Two specimens, agreeing fully with some from Wisconsin, Ill., etc., were taken by the author at Colorado Springs (Aug., 1910).

Family *Lithobiidae*.

But one genus of this family is represented by the species thus far found within the State, namely, *Lithobius*. None of the species conforms to *Monotarsobius*, which Verhoeff would separate from *Lithobius*. Probably *Vothropolys* will be found in the western or north-western parts of the State, where *B. bipunctatus* and possibly also *B. permunda* or an allied species may be expected. The following key will aid in showing the relations between species thus far known from the region.

Key to Species of *Lithobius*.

- a. Angles of the 7th, 9th, 11th and 13th dorsal plates produced.
Articles of antennæ 30-40 ; prosternal
teeth, 6 + 6, 7 + 7 *L. mordax* Koch.
- aa. Angles of the 9th, 11th and 13th dorsal plates produced.
 - b. Claw of anal legs armed with a single spine or accessory claw at base.

- c. Claw of penult legs armed with two spines.
Spines of penult legs 1, 3, 3, 2; of first legs 1, 1, 1; claw of female gonopods entire *L. ædipes* Bollman.
- cc. Claw of penult legs armed with a single spine.
Spines of penult legs 1, 3, 3, 1; of first, 1, 3, 1; claw of gonopods of female tripartite *L. harriete* Chamberlin.
- bb. Claw of anal legs unarmed.
Coxal pores transverse; articles of antennæ 33 to 43 or more; ocelli 20 to 50 *L. forficatus* Linn.
- aaa. Angles of none of the dorsal plates produced.
 - b. Claw of the anal legs unarmed.
Spines of first legs 2, 3, 1-2, 3, 2; of anal 1, 3, 2, 1; claw of female gonopods entire *L. jowensis* Meinert.
 - bb. Claw of anal legs armed with one spine at base.
 - c. Articles of antennæ 25-32.
Spines of first legs 0, 1, 1; of penult legs 1, 3, 3, 1; of anal 1, 3, 1, 0-1, 3, 2, 0 *L. tivius* Chamberlin.
 - cc. Articles of antennæ normally 20-21. (Spines of penult legs 1, 3, 3, 2.)
 - d. Spines of anal legs 1, 3, 2, 0; penult legs armed with one spine at base; spines of first legs 1, 3, 1; claw of female gonopods tripartite; length, 12-16 mm *L. dopaintus*, sp. nov.
 - dd. Spines of anal legs 1, 3, 2, 0; claw of penult legs with two spines; spines of 1st legs 1, 1, 1-1, 2, 1; claw of female gonopods mostly bipartite; length, 7-8 mm *L. coloradensis* Ckll.

Lithobius mordax Koch.

A single male appearing to be this species has been examined from the State. It had lost the posterior pairs of legs. The species abounds in the States to the south-east.

Boulder Co. (Cockerell).

Lithobius ædipes Bollman.

A number of specimens, both males and females, were taken by the author at Manitou (1910). The species was known previously only from the type specimens which were from Arkansas.

Lithobius harrieta Chamberlin.

Described originally from specimens collected some miles east of Glenwood Springs (author, 1904). Several specimens of the species have also been received from Prof. Cockerell, who secured them in Boulder Co.

Lithobius forficatus (Linnæus).

Numerous specimens were obtained by the author at Colorado Springs (1910). The species will doubtless be found common in and about towns along the western sides of the mountains, and especially northward. This is the most abundant North American member of the genus, occurring throughout the northern sections, but not ranging into the southern States.

Lithobius dopaintus, sp. nov.

None of the dorsal plates with posterior angles produced.

Articles of antennæ 20.

Ocelli about 15, arranged in four series: 1 + 5, 5, 3, 3. The ocelli of the most dorsal series distinctly larger than the others.

Prosternal teeth 2 + 2.

Last two pairs of coxæ laterally armed, the last three pairs dorsally armed.

Spines of the first legs 1, 3, 1; of the penult 1, 3, 3, 2, the claw armed with a single spine; of the anal 1, 3, 3, 1, the claw armed likewise with a single spine.

Coxal pores round, 4, 6, 5, 5.

Claw of the gonopods of the female tripartite; basal spines 2 + 2, apically bi- or tridentate.

Length, 12-16 mm.

Locality, Manitou (author, 1910).

About a dozen specimens were secured. Apparently most closely related to *L. socius* Chamb. of Utah.

Lithobius tivius Chamberlin.

Angles of none of the dorsal plates produced.

Articles of anteanæ 25-32, but mostly 28 and 30.

Ocelli mostly 8 or 9, arranged in two series, which form a narrowly elongate patch: 1 + 4, 3-1 + 5, 3.

Prosternal teeth 2 + 2.

None of the posterior coxæ armed either laterally or dorsally.

Spines of the first legs 0, 1, 1; of penult 1, 3, 3, 1, the claw armed with one spine; of anal 1, 3, 1, 0 (mostly) -1, 3, 2, 0 (rarely 1, 3, 0, 0), the claw armed with one spine.

Coxal pores round, 3, 4, 4, 3.

Claw of the gonopods of the female tripartite, one lateral lobe commonly small, and sometimes almost obliterated, leaving the claw bipartite. Basal spines 2 + 2.

Length, ad 8 mm.

Locality, Manitou (author, 1910).

Numerous specimens, agreeing mostly with the description above, were secured. These bring the species still closer to *L. exiguus* Meinert, from which, however, all the western specimens examined seem to present constant differences.

Lithobius coloradensis Cockerell.

Syn. *Lithobius kochii* Stuxberg, Bollman, 1888, Proc. U. S. N. M.

Lithobius kochii, var. *coloradensis* Cockerell, 1893, Tr. A. Ent. Soc.

Lithobius kochii Stuxburg, Chamberlin, 1909 (in part), Ann. Ent. Soc. America.

Reported from West Cliff (Cockerell, collector) by Bollman. Several specimens in bad shape, in having lost the last pairs of legs, but seeming to be this species, were secured by Prof. Cockerell in Boulder Co. and sent to the author. The specimens seen, upon careful study are found not to be identical with the California form.

Lithobius jowensis Meinert.

Syn. *L. bilabiatus* Bollman (nec Wood), 1887, Proc. U. S. N. M.

L. bruneri Kenyon, 1893, CANADIAN ENTOMOLOGIST.

No dorsal plates with angles produced.

Antennæ with 20-25 articles, the number of articles of the left antenna exceeding those of the right in the Colorado specimens examined.

Ocelli about 14, in 4 series: 1 + 4, 4, 3, 2.

Prosternal teeth 2 + 3-3 + 3.

Last three pairs of coxæ dorsally armed; last two pairs laterally armed.

Spines of 1st legs 2, 3, 1-2, 3, 2; of penult 1, 3, 3, 2; the claw armed with two spines; of anal 1, 3, 2, 1, the claw unarmed.

Coxal pores round, 3, 4, 4, 3.

Gonopods in female with the claw entire; basal spines conical, 2 + 2.

Length, 11-15 mm.

Locality, Manitou (author, 1910).

Several specimens agreeing essentially with the description above were secured.

SUBSCRIBERS to the CANADIAN ENTOMOLOGIST are reminded that the annual dues of one dollar were payable last month. Remittances should be made by post office or express orders, and should not be made payable to the Editor, but to THE ENTOMOLOGICAL SOCIETY OF ONTARIO, GUELPH, ONT.

BOOK NOTICE.

THE DETERMINATION OF DOMINANCE AND THE MODIFICATION OF BEHAVIOUR IN ALTERNATE (MENDELIAN) INHERITANCE, by conditions surrounding or incident upon the Germ cells at Fertilization. By Wm. L. Tower (Biol. Bulletin, Vol. XVIII, No. 6, 1910).

Prof. Tower has been engaged in an evolutionary study of the genus *Leptinotarsa* since 1895. In 1906* he published extensive data concerning this group from a number of points of view. The most interesting part of the results made known at that time was the production of new forms by exposing the beetles to extreme conditions of temperature and moisture during the period of the growth and maturation of the germ cells. The new forms were bred under normal conditions, and bred true in every case. All of the new forms (or nearly so) occur under natural conditions, either as distinct species or as extreme variants (sports). The new forms were obtained in varying proportions. In the best experiment all of the progeny (those that reached the adult stage) were of the new type.

In the present article Prof. Tower has given the results of a series of experiments to determine the effect (as shown in succeeding generations) of external conditions on hybridization. Here, also, extreme conditions of temperature and moisture were the factors. The contrasted characters in the beetles crossed were such as gave under certain conditions (normal?) typical Mendelian proportions in the second generation after crossing. In crosses between *L. signaticollis* and *L. diversa* the results varied, depending upon the conditions during mating, from one in which the offspring of the first generation were all true hybrids, as shown by a splitting into three groups in the second generation, to one in which all the offspring of the first and succeeding generations were entirely like the female *signaticollis* parent. In crosses between *L. undecimlineata* and *L. signaticollis* the results were similar, but more complicated, owing to there being three pairs of contrasted characters instead of a single pair.

*W. L. Tower, Evolution in Chrysomelid Beetles of the Genus *Leptinotarsa*. Carnegie Institution, Publication No. 48.

These results, as published, are marred by contradictory statements in reference to one of the experiments. Briefly, the result of the second part of Exper. No. H 409/411 should be, and is stated to be, the same as the result of Exper. No. H 410, but the result described on p. 295 and figured in Plate III is anything but that of H 410! The article being a preliminary one, many of the details are very meagre. This is especially the case with regard to the duration of the peculiar conditions and with regard to the conditions (normal?) under which the subsequent generations were bred. The title of the article calls for peculiar (varying) conditions at fertilization. In most cases the author states that the species were crossed or mated under the conditions, but in one case he states that the eggs developed under the conditions. This permits of the results being in part purely ontogenetic. Some of the results appear to indicate this. However, the interaction between the two germ plasms might be assumed to continue throughout the ontogeny. In that case a longer duration of the stimuli would be advisable.

In the previous experiments the different kinds of progeny were isolated and bred separately (Experiments in Analysis). In another series of experiments the species were permitted to hybridize freely under diverse natural conditions, and these are called Experiments in Synthesis. Crossing between *L. undecimlineata* and *L. signaticollis* at Cuernavaca resulted finally in the complete disappearance of the former species. The same cross at Paraiso resulted in the disappearance of *L. signaticollis*.

In experiments with *L. decemlineata*, *L. oblongata* and *L. multitaeniata*, conducted at four different places, a single type, which bred true, was obtained in each case, but of the types obtained no two were alike. The type at Balsas was a complex of the three species used. The type at Escamela was an intermediate between *L. decemlineata* and *L. oblongata*. The type at Tucson was a variable one, with the characters of *decemlineata* dominant. The type at Chicago appeared to be pure *decemlineata*. Subsequent cultures of these types (with the exception of the last) gave sporadic variants (2-3%), which were reappearances of "characters or combinations thereof that went into the cross." Tower compares these with De Vries' *Enothera mutants*, and states that they behave in a similar fashion. The author maintains that the variable outcome of these crossings under natural conditions is the result, not of any process of natural selection, but of some process of hybridization, which is influenced by the external conditions. He states that this view is fully borne out by experiments in which the selective factor was eliminated.—[A. G. HUNTSMAN, Biological Dept., University of Toronto.]

The Canadian Entomologist.

VOL. XLIII.

LONDON, MARCH, 1911.

No. 3

GEOMETRID NOTES ON THE GENUS *HYDRIOMENA*, HUB.

BY L. W. SWETT, BOSTON, MASS.

As I was unable to identify material in this group, and realizing that the species were badly mixed, I decided to try to straighten them out. First, I was puzzled by the markings, I could find little constancy and every style of variation; secondly, in similarly marked species every variety of colour occurred, which made the specimens so different looking that I did not dare call them the same. Starting with the first species of *Hydriomena* in Dyar's List, namely, *Hydriomena sordidata* Fab., I was struck with the variability of colouring and markings, and realized that I must depend on something more constant than markings to separate such an unwieldy mass of specimens. The genitalia, an important character, I was unable to study much, as most of the material at my disposal was loaned, so that I could not proceed very far, but I noticed that the palpi of certain species seemed to be of approximately the same relative length, allowing for variation in size of specimens. This set me on the right path, as I found that by grouping certain species with palpi of the same length I could follow the variations in colour, and that there seemed to be a regular colour scheme in variable species, so that by knowing the colour of the type specimen I could predict the variations to a certain extent that ought to occur under the species. The colour scheme suggested itself to me from a French author's work on another group, and I found I could apply it here. *Hydriomena sordidata* Fab., or more properly *furcata* Thunberg, Diss. Ins. Suec., pt. 1, Dec. 11, 1784, has priority over *sordidata* Fab., Ent. Syst., III, pt. 2, p. 185, 1794, which my kind friend, Mr. Louis Prout, first points out in the Entomologists' Record (London). Vol. 9, p. 84-87, April, 1897. *Hydriomena sordidata* Fab. does not become a synonym, as it is a green variety of *furcata* Thunb., and should be listed so. An excellent figure of *furcata* is given, tab. 3, No. 10, and it is strange that the older authors did not recognize this. The colour scheme of *Hydriomena furcata* Thunb. is as follows, and applies to the other variable species: 1, cinereous or gray; 2, greenish; 3, reddish; 4, yellowish; 5, suffused; 6, mesial space white.

All these colours may occur with or without the dark bands, or there may be combinations. The first five colours seem to be most commonly met with, the white-banded form being the rarest. Now, according to my theory, we should find all the above variations of colour with palpi of approximately the same length, which we do find; and this enabled me first to see my way clear through the variations. Food-plants, I feel sure, play an important part in the colour variation, as does altitude; mountainous forms varying more than lowland. I should like to make the revision more complete by comparing the life-histories of the American species with those of the European, and also the genitalia, but until this can be done my work will remain rather crude, but, at any rate, a ready means of grouping them. The specimens examined were mostly loaned, so that is why I have done so little work on the genitalia, and it may be possible that the true *furcata* Thunb. is not found in North America, the variety *quinquefasciata* Pack. taking its place here. This point can be, perhaps, decided on a more complete comparison with the European form. The length of the palpi seems to be a very constant character, and I examined some six hundred specimens. It is surprising that the older authors like Packard and Guenée failed to notice this, Packard having lumped species with very long palpi, such as *glauca* Pack., *bistriolata* Zell., with such species as *nubilofasciata* Pack. and *furcata* Thunb., in which they are short. *Hydriomena furcata* or its variations have never been taken in New England, and I should say are strictly western. Just what the boundaries are I cannot say, as the species have been so confused. I notice one difference between European and American forms of *furcata*, that is the basal band is heavier and wider in the latter than in the European form, but I would hesitate to separate them on such slight differences. Both forms have sometimes a white streak on inner margin of fore wings, but this is not always present.

Taking the species of Dyar's List, and applying my palpi and colour scheme they would arrange as follows:

I. *Hydriomena furcata* Thunberg, Diss. Ins. Suec, pt. 1, 1784.

—*sordidata* (of authors) not Fab.

Short palpi, cinereous ground colour.

The true *furcata* (like fig. 10, table 3) may not occur in North America, as I have not seen a specimen exactly like the European form, and the forms seem closer to *quinquefasciata* Pack. than *furcata*. If it is found here, the west will probably be its home, as none of the varieties

or typical form are recorded from the east. *Hyd. furcata* is more heavily speckled than *quinquefasciata* Pack., and the extradiscal line is much narrower after it leaves the costa than in *quinquefasciata*, where it is heavy and broad the entire distance. I saw a ♂ in Dr. Barnes' collection from Arrowhead Lake, B. C., July 16-18, which seems nearer to typical *furcata* than anything I have seen. It is not unlike German and Iceland specimens in my collection. There seems to be some doubt in the Rev. Geo. W. Taylor's mind whether we get the true *furcata* here, and I am inclined to agree with him, yet they run so close in markings as to be difficult to separate, and I shall leave them as listed until I can study the genitalia and compare the life-histories, which must be done to complete my work, as it is, in a way, superficial.

Var. (a) *elutata* Hüb., Schmett Eur., 224 (post 1797). This is a synonym of *furcata* Thunb. according to Mr. Prout's and my own views, and should be dropped from our lists.

Var. (a) *quinquefasciata* Pack., Proc. Boston Soc. Nat. Hist., XIII, p. 397, 1871, Monog. p. 100, 1876.

Short palpi, smoky bands, clear discal space.

This may be the North American form of *furcata* if we do not get the European here, and it is a variety at any rate. The figure in Packard's Monograph, Plate VIII, fig. 36, is excellent. There is an error in fig. 35, as this is not *furcata* nor a variety of it, but a green form of *nubilofasciata* Pack., which is in his collection and which I examined. The differences between *quinquefasciata* and *furcata* are in the former having a clear gray mesial space where the latter is irrorated, in the smoky bands of the former and form of the extradiscal or fifth band from body. Dr. Barnes has a ♂ from Arrowhead Lake, Aug. 24-31, in which the bands are bluish instead of smoky, otherwise it is like *quinquefasciata*. I have seen a similar form from Calgary, July 24. This var. *quinquefasciata* is found probably through the whole Northwest, and does not vary greatly. Mr. A. J. Croker, of Victoria, B. C., has a specimen from there, taken July 27, 1909, in which the white round spot of typical *furcata* appears in the middle of the fifth band of fore wing, near the inner margin. The general colour is smoky-gray, and resembles a variety of *speciosata* Pack., and would be hard to separate were it not for the long beak-like palpi of the latter. The ground colour varies from greenish to reddish, the specimen I have from the Rocky Mts. seems more brownish. In the European varieties of *furcata* the extradiscal line tapers to a narrow line near the inner

margin, as a general rule, whereas, in the American, it is the same width from costa to inner margin. Packard's statement that the outer margin is clear has little weight, as it is so in most forms of *furcata* Thunb., except in var. *infuscata* Staudinger, where it is smoky-brown. The type, one ♀, Calif. (Behrens), is in the Packard collection.

Var. (B) *viridata* Pack., Proc. Boston Soc. Nat. Hist., XVI, p. 21, 1874. Monograph, p. 101, 1876.

Short palpi, greenish.

In his original description Packard calls attention to this form as being close to *quinquefasciata*, and he is quite correct, as it is a greenish variety of *furcata* Thunb., and is almost exactly like German examples of var. *sordidata* Fab., which is the green form of the European variety. Variety *viridata* may sink later to a synonym of *sordidata* if we get the true *furcata* here. The palpi of the type are only moderate, and not long as Packard states, and the ground colour of the fore wings is greenish-yellow. The type, 1 ♀, Calif. (Behrens), is in the Packard collection and very perfect.

Var. (C) *sordidata* Fab., Ent. Syst., III, pt. 2, 185, 1794.

Short palpi, heavily irrorated, greenish.

This green form I retain in our lists until it is proved that the European one does not occur here, but if it does, then *viridata* Pack. will become a synonym of var. *sordidata*. There is very little difference between the two in the markings, but until the genitalia are studied we cannot be certain as to their standing. *Hyd. sordidata* in Europe is said to feed on the willow, but we have no records of the food-plant of *viridata* here. Mr. Fred. X. Williams, of San Francisco, sent me a specimen from there, captured May 12th, 1909, that is very close to specimens in my collection from Germany, except that the basal line is broader, as is also the extradiscal, and straighter, which may be the differentiating point between the North American and European forms. So *sordidata* becomes a variety and not a good species, on account of Thunberg's priority.

Var. (D) *resecta* Swett, CAN. ENT., Vol. XLII, Aug., 1910.

Short palpi, reddish ground colour.

This is the red form of *furcata* Thunb., and corresponds to the European, red variety, *testacea* Prout, only the markings are same as in *furcata*. This is very similar to *Hyd. reflata* Grote, only the latter is gray and has a broad black mesial band where *resecta* is reddish, and has a narrow mesial band, which also distinguishes it from the red variety of *reflata* which sometimes occurs in Arizona. This form *resecta*

is deeply suffused with red, and sometimes has the typical white spot near outer portion of fore wing, but always has narrow mesial band. I imagine this variety is not very commonly met with, as I have seen only short series and mostly from California.

Var. (E) *periclata* Swett, CAN. ENT., Vol. XLII, Aug., 1910.

Short palpi, suffused.

This is the smoky, suffused form of *furcata* Thunb. The type specimen is speckled with green, but probably in specimens not so perfect, the green colouring may not be so prominent. This is related to var. *infuscata* Stgr., of Europe, and holds the same position, only it lacks the smoky-brown of the Iceland specimens before me and is more like a melanic form than the European. The bands are as in typical *furcata*, only the basal is broader.

Var. (F) *albifasciata* Pack., Sixth Rep. Peab. Acad. Sci., p. 41, 1874. Previously figured Proc. Boston Soc. Nat. Hist., XVI, pl. 1, fig. 5, 1874. Monograph, p. 97, 1876.

Short palpi, greenish, white mesial space.

Mr. G. W. Taylor, of Wellington, B. C., first separated this variety from the genus *Enchoria* Hulst, and placed it correctly as a *Hydriomenid*, but stopped there (Ent. News, p. 310, July, 1907). Where to place it is the next question. It has the short palpi, so will go in the short palpi group, and remembering that *furcata* Thunb. has a white-banded form in Europe, it seems not unreasonable to suppose this is the white-banded variety of our species. I so place it according to palpi and colour scheme, and I notice Mr. L. B. Prout does the same in his article, Ent. Record (London), Vol. IX, p. 84-87, April, 1897, and was the first to so place it. I did not put it there on that account, but because of the relationship to the white-banded *fusco undata* Donovan of Europe, which it somewhat resembles, the only difference being the course of the extradiscal line of fore wing, which runs out almost to outer border at vein 4, while this does not occur in the European form. Thus, *albifasciata* Pack. becomes a variety of *furcata*, and in this I believe I am quite correct, as the white mesial space would show. This colour variety may be caused by its food-plant, as var. *fusco undata* Donovan is said to be produced by feeding on the bill-berry, but there is no record of the food-plant of *albifasciata* so far as I know. Rev. G. W. Taylor and Mr. Grosbeck both suggest that *reflata* Grote and *abacta* Hulst may be synonyms of *albifasciata* Pack., but after comparing types with specimens in my collections, there are differences which I will point out later in the revision. On page 310, July, 1907, Ent. News,

Rev. Taylor says it is not a variety of *sordidata* Fab. This is true in a measure, as *sordidata* is only a variety itself. The suffused green colour with white central band will distinguish *albifasciata* from any variety. It is closest to var. *vulnerata* of Swett, but in the latter the green is replaced by red and has more bands on the fore wing, there being a marginal band in *vulnerata*. Type, 1 ♀ from Calif., in Pack. coll. This includes all the varieties under *furcata* for the present, and the others listed in Dyar's Catalogue under *sordidata* Fab., such as *glaucata*, *bistriolata*, *nubilofasciata*, are all good species and go into other groups, as I intend to show later. Next after *furcata* and its colour varieties comes a very closely-allied species, *Hyd. reflata* Grote.

2. *Hydriomena reflata* Grote, CAN. ENT., XIV, 186, 1882.

Short palpi, grayish.

This species has been a stumbling block for all of us, as the types in the Brooklyn Institute of Sciences (Neumoegen coll.) were unknown for some time to specialists. Rev. G. W. Taylor (Ent. News, July, 1907, p. 310 and 311) says *albifasciata* Pack. is very close to this, which is true, but the following differences can be distinguished, as I have just returned from examining the types of both. The mesial band or second band from body is very broad and black. Mr. Grote makes special mention of this, and it is constant in all specimens I have seen so far, and the general colour is gray, where the mesial band in *albifasciata* is very narrow and the general colour is greenish with white mesial space. There is a cone-shaped projection in the extradiscal band which is not found in *albifasciata*. Dr. Barnes has a beautiful red variety of *reflata* from Arizona, male and female, but the wide black mesial band is constant as in the types. Specimens from Arizona and Victoria, B. C., both show this striking black band and cone-shaped projection, which I do not find in *albifasciata*. I place *reflata* Grote as a good species on account of these differences, and because it has a red variety with the characteristic markings. The white spot near the outer margin would tend to show that it is an allied form of *furcata*, so I place it to follow *furcata*. *Mesoleuca abacta* Hulst, described in CAN. ENT., Vol. XXX, p. 117, 1898, was said to be a *Hydriomena* by Mr. Grossbeck in Trans. Am. Ent. Soc., XXXIII, Nov., 1907, and would probably be a synonym of *reflata* Grote. This is quite true, as I have a photograph of the type sent me by Mr. Grossbeck through Prof. J. B. Smith's kindness, and it is the same as *reflata*, the broad black mesial band showing plainly. The specimen in Brooklyn is

also the same, so *abacta* Hulst becomes a synonym of *reflata* Grote. There is a type in the National Museum, 3924, which I did not see. Types of *reflata* Grote, 1 ♂ and 1 ♀, Arizona, coll. of B. Neumoegen, Brooklyn Institute.

3. *Hyd. nubilofasciata* Pack., Proc. Boston Soc. Nat. Hist., Vol. XIII, p. 398, 1871. Monog., p. 98, pl. VIII, figs. 31 and 35.

Short palpi, yellowish.

This is a good species and not a variety, as Packard placed it, being distinct in its size and markings from *furcata*. It is incorrectly spelled in Dyar's Catalogue. The marginal band on fore wing separates it from any other species at a glance. The type have yellowish ground colour with reddish shading in the mesial space, and it looks rather different from all other species and varieties. It is closely allied to *furcata* Thunberg, so I placed it to follow *reflata*. Prof. Packard's plate in the Monograph clearly shows the markings, and I think most collections have this form correct, but it is a very variable species, and according to my colour theory has the same varieties as *furcata*, which are as follows: The types, ♂ and ♀ (Edwards & Behrens), from California, are in the Packard coll. at Cambridge. I have specimens from Oregon, Arizona, California and British Columbia before me, showing that it occupies a wide range of territory.

Var. (A) *raptata* Swett, CAN. ENT., Vol. XLII, Aug., 1910.

Short palpi, greenish.

This is the green form of *nubilofasciata* according to my colour scheme, and the markings are the same as type, only the ground colour of the fore wings is green, without any other shading, making it look quite distinct.

Var. (B) *scalata* Warren, Nov. Zool., p. 519. Vol. II, 1904.

Short palpi, green, red shading.

I believe this to be a colour variety of *nubilofasciata*, as the latter is found in the type locality, Mr. Marloff sending me specimens from Oregon. Mr. Warren, in his description, speaks of the characteristic marginal band which is found only in *nubilofasciata*, the difference being the colour of the fore wings of *scalata*, green with red shading.

Types, 2 ♂'s, Gold Hills (Biederman); the size, 38 mm., is rather puzzling, as the type is small.

Var. (C) *cupidata* Swett, CAN. ENT., XLII, Aug., 1910.

Short palpi, reddish.

This is the red form of *nubilofasciata*, and corresponds to red form *resecta* Swett, of *furcata* Thunb., for the marginal band separates them, as it does in all forms of *nubilofasciata*.

Var. (D) *cumulata* Swett, CAN. ENT., Vol. XLII, Aug., 1910.

Short palpi, suffused.

This is the suffused form of *nubilofasciata*, and should be so placed. It resembles slightly var. *inter-fuscata* Staud., of *furcata*, and corresponds to this variety, but the marginal band on fore wings separates them.

Var. (E) *vulnerata* Swett, CAN. ENT., Vol. XLII, Aug., 1910.

Short palpi, white-banded.

This is the white-banded form of *nubilofasciata*, and corresponds to *fusco-undata* Donovan of Europe, and is closer than to the American variety of *furcata*, form *albifasciata*. The ground colour of *vulnerata* is reddish, with snow-white mesial space.

Var. (F) *sparsimacula* Hulst, Trans. Am. Ent. Soc., XXIII, p. 285; 1896.

Short palpi, marks on costa only.

I saw a specimen of *sparsimacula* marked "type," in the handwriting of Hulst in the Brooklyn Institute, agreeing with a photograph of the type in the Hulst collection at New Brunswick, and this is a variety of *nubilofasciata*, being greenish, with the bands showing at costa only. It is possible these are rubbed specimens and not worthy the name, but it is best to give it the benefit of the doubt until a series can be examined. Types in Brooklyn Institute and New Brunswick are labelled "Calif." Mr. Hulst says in his description, "near *californiata* Pack.," but it resembles neither this species nor *glaucata*, both of which belong to other groups.

4. *Hyd. manzanita* Taylor, CAN. ENT., Vol. VIII, also Grossbeck, Proc. Ent. Soc. Wash., Vol. X, Sept. 11, 1908.

Short palpi, gray.

This is the long-winged species, and not to be confused with any other. Mr. Taylor kindly sent specimens from Victoria, and I have seen them from other localities, and I do not see that they vary, all being a dull gray.

5. *Hyd. cochiseata* Swett, CAN. ENT., July, 1909.

Short palpi, gray, white mesial space.

This is a large species, and does not resemble any other so far as I can see. The wide, white-banded mesial space would make one imagine

that it might be the white-banded form of some undescribed species. Mr. Broadwell has another specimen in which the central band is suffused, and the whole insect has a grayish appearance. Types, 2 ♂'s, in Mr. Broadwell's coll., Newark, N. J.

6. *Hyd. pernotata* Hulst, CAN. ENT., XXX, p. 117, 1898.

Short palpi, gray. Said by Dr. Dyar "to be *Hyd. magnoliata*."

This species seems very hard to place, and as I have not seen the type, I cannot say exactly what it is like, but, according to the description, it belongs to the short-palpi group. The type is from Fort Wrangel, Alaska, and is in the U. S. National Museum.

7. *Hyd. irata* Swett, CAN. ENT., Vol. XLII, p. 280, Aug., 1910.

Short palpi, gray, reddish suffused.

This is a very peculiar species, and looks almost exactly like *californiata* Pack., except that it lacks the longer palpi and has subdentate antennæ. It also resembles var. *perfracta* Swett, of *autumnalis*, but differs again in the antennæ and palpi, and also in the black lines across the mesial space on veins 2 and 3. The peculiar antennæ would almost seem to place it out of the *sordidata* group, as it really lacks the smooth flattened antennæ of that group, in some specimens being very subdentate. No doubt this species has been confused with *californiata* Pack., but its earlier appearance (in May, where *californiata* flies in July) will also help to separate them. The females appear to be quite rare, as Mr. Croker, who kindly sent me a series of males, stated that he took but one or two.

This includes all the species and varieties of the short-palpi group so far as known. By "short palpi," I mean hardly projecting beyond the head, or 1 mm. in length. The "mesial band" is the group of three bands forming the basal, second and intradiscal. The mesial space is the area between intradiscal and extradiscal lines. In regard to the colour varieties, I am opposed to giving every form a name, as it would fill up the catalogue unnecessarily, and I do it only where variable species could be confused, as it would be impossible to separate the species if this were not done, e.g., the red varieties of *nubilofasciata* and *furcata*, *californiata* and var. *perfracta* Swett, of *autumnalis*. The colour scheme seems to work out well, and gives us the first means of separating an unwieldy mass of specimens, but the palpi seem to be the most important character, as we know in which of the three groups—short, moderate or long—to place it. There is possibly one change to be made later in the colour scheme regarding green and yellow. I notice that specimens emerge yellow, while others, at first green, turn yellow after flying for some

time. These two colours, therefore, might be merged under one, but the effect is so different in some cases that I believe it is better to keep them separated until they are better understood. I have made a key to the species and varieties which ought to make their classification fairly easy. I shall be glad to have any criticisms or corrections on my work, as it is impossible not to make errors on such a difficult group and one so little understood at present.

I wish to thank the following gentlemen for either loan of specimens or help: Messrs. William Reiff, Barnes, Taylor, Broadwell, F. X. Williams, Grossbeck, Doll, Croker, Pearsall, Henshaw, Prout, Marloff and Bistleberger, and it is owing to their generosity that I have been able to accomplish this beginning.

SHORT-PALPI GROUP.

- | | |
|---------------------------------------|--|
| 1. <i>Hyd. furcata</i> Thunb. | { Colour scheme cinereous. |
| Syn. = (a) <i>elutata</i> Hub. | |
| Var. (A) <i>quinquefasciata</i> Pack. | (a) fuscous, less irrorated, clear discal space. |
| " (B) <i>viridata</i> Pack. | (b) green, smoke bands. |
| " (C) <i>sordidata</i> Fab. | (c) yellowish-green. |
| " (D) <i>resecta</i> Swett. | (d) reddish. |
| " (E) <i>periclata</i> Swett. | (e) suffused. |
| " (F) <i>albifasciata</i> Pack. | (f) white mesial band. |
| 2. <i>Hyd. reflata</i> Grote. | { Gray, wide black central band. |
| Syn. = <i>abacta</i> Hulst. | |
| 3. <i>Hyd. nubilofasciata</i> Pack. | Yellow, reddish cast. |
| Var. (A) <i>raptata</i> Swett. | (a) green, suffused. |
| " (B) <i>scalata</i> Warren. | (b) red and green, green shaded. |
| " (C) <i>cupidata</i> Swett. | (c) red. |
| " (D) <i>cumulata</i> Swett. | (d) suffused, smoky. |
| " (E) <i>vulnerata</i> Swett. | (e) white banded. |
| " (F) <i>sparsimacula</i> Hulst. | (f) marks on costa only. |
| 4. <i>Hyd. manzanita</i> Taylor. | Gray, long fore wings. |
| 5. <i>Hyd. cochiseata</i> Swett. | Gray, white banded. |
| 6. <i>Hyd. pernotata</i> Hulst. | Gray, red stained. Probably <i>Hyd. magnoliata</i> Gn. |
| 7. <i>Hyd. irata</i> Swett. | Gray, red shaded. |

This includes all the species and varieties that should be placed in the short-palpi group. The others I shall treat of in the moderate and long palpi groups.

THE LIFE HISTORIES OF TWO LYCÆNID BUTTERFLIES.

BY E. J. NEWCOMER, PALO ALTO, CAL.

Chrysophanus zeræ Bdv.

Nothing has hitherto been written on the early stages of *Chrysophanus zeræ*, except a short description of the egg, made from a single specimen by Mr. K. R. Coolidge, in *Psyche*, XVI, 31. This egg was collected by me at Deerpark, Placer Co., Cal., in 1908. It was the only one found, and I did not at that time have the leisure to hunt for others. However, I spent six weeks in the same locality during the summer of 1909, and determined, if possible, to work out the life-history of this species, which is quite abundant in the Sierra Nevada Mountains. The one egg I had found (I saw the female lay it), was on an inconspicuous plant not over eight or ten inches high, growing on a flat place among other species of plants of the same general size and appearance.

In 1909 I looked over the ground and decided that the food-plant of *zeræ* was one of two species. A careful search for eggs on these two species revealed none. I then watched every female I came across, and one day was rewarded by seeing a female lay an egg, and it was on one of the two likely plants. I immediately captured several females and confined them under mosquito netting placed over growing plants of this species, which is *Polygonum douglasii* Greene. The next morning all that was left of the butterflies was a wing or two—ants had taken care of the rest; but there were a number of eggs on the stems of the plant. By a repetition of this method I secured about sixteen eggs. These eggs were laid on July 27th and 28th. As they had not hatched when I returned home, I put them in a cool place to hibernate. The larvæ began to come out on February 15th, and the last one hatched late in March. I gave the first larvæ leaves of our common *Polygonum aviculare*, but they refused to eat them, and died in a few days. Several which hatched later, I tried on *Rumex*, and succeeded in rearing some of them.

The young larva begins eating the shell of the egg at the micropyle, and makes an irregular hole, through which it escapes. It does not consume the remaining eggshell. The larva, in its earlier stages, eats pits into the leaves, but in the last two instars the leaves are entirely devoured. The larvæ that I reared pupated about seven weeks after hatching, and the adults emerged two or three weeks later. Thus in one case the larval stage lasted 48 days and the pupal stage 17 days, making a total of 65 days from egg to adult. In another case the larval stage was 52 days and the pupal 14 days, making 66 days altogether.

March, 1911

Egg.—Diameter, 0.85 mm.; height, 0.50 mm. "Shape depressed spheroid,"* ornamented with deep, polygonal pits, smallest and shallowest about the micropyle; micropyle in a rather deep depression. Base of the egg flat and smooth. Colour pale bluish, the raised network about the pits white.

Larva, First Instar.—Length, a little over 1 mm. Slug-shaped; brownish-yellow, thickly covered, particularly laterally, with minute black dots. A row of long, dark brownish, rough hairs on each side of the dorsal line, extending from segments 2 to 12, one hair to a segment in each row; another row of finer, shorter hairs laterad of this row, extending from segments 2 to 9, the individual hairs caudo-laterad of the corresponding ones of row 1. A fringe of more delicate hairs on the lateral ridge, also a number of scattered ones on first segment. All these hairs proceeding from tubercles of a shiny brownish colour, black at insertion of hair. A hairless tubercle laterad of each large subdorsal hair on segments 2 to 10, and another caudo-laterad of this on segments 5 to 9; also a pair caudo-laterad of large hairs on segment 10, corresponding to those bearing hairs of second row on preceding segments. Cervical shield shining brown, with some small hairs. A brownish plate on each side of dorsum of segment 12. Some minute hairs on ventral side. Head retracted, dark, nearly black. Later the colour becomes dull greenish, and a pinkish dorsal stripe appears.

Second Instar.—Length, 3.5 mm. Colour greenish, dorsal line dull, deep rose, a whitish line on each side; lateral margin light pinkish or whitish; head black. Hairs arranged as in first instar, with the addition of a long hair on each side of cervical shield and several cephalad; a hair on segment 11 on the dorsal line, caudad of the two described in first instar, and one on segment 12 cephalad of the other two. Plates on segment 12 indicated by two depressions.

Third Instar.—Length, 5 mm. Dorsum more convex than before. Body uniform pale green, except for a slight rose-coloured dorsal line; cervical shield green, slightly darker than the body. A sparse covering of whitish or brownish pile. Arrangement of hairs as before; plates of 12th segment indicated by two slight depressions.

Fourth Instar.—Length, 11–12 mm. Slug-shaped, widest at about the third or fourth segment, narrowing somewhat, and becoming more flattened posteriorly; segmentation distinct. Body pale grass green,

* Psyche, l. c.

dorsal line darker or claret-colored, most conspicuous on middle

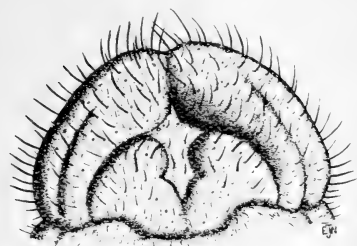


FIG. 3.—Cervical shield of larva of *Chrysophanus cerv.*

segments, and with a lighter line on each side; lateral line whitish; cervical shield (Fig. 3) sunken, in the shape of a double diamond, the one cephalad largest, bluish-gray, with a lighter line down the centre. Dorsal and lateral hairs and a few small ones dorso-laterad, brownish; remaining small hairs whitish. Dorsal side of body covered with scattered, white, hairless

tubercles, scarcely visible to the naked eye. A small pit on each side of 12th segment, grayish at the bottom. Head dark brown, fore legs light brown, claws darker, prolegs light green; the minute hooks on these reddish brown. Length before pupation 17 mm.; width, 5 mm.

Pupa.—Length, 10.50–10.75 mm.; width, 4–4.25 mm. Rather stout, but longer for its breadth than usual with lycænid chrysalids; venter approximately straight; dorsum with two humps, one on the thorax and the other at the third and fourth abdominal segments; widest near the posterior end of the wing-cases, opposite the third abdominal segment; head abruptly narrower than the thorax. Colour at first very pale yellowish-green, with a pinkish dorsal stripe; later, ground colour pale straw-yellow, with a slight greenish tinge about the thorax. An irregular reticulation of brown lines on dorsal and lateral sides, visible with a low-power lens; a number of brown blotches on the ventral side of the head, also some lighter ones on the cases of the antennæ, palpi and wings. A distinct, narrow, brown or pinkish, dorsal line on the thorax, and a wider, more suffused one on the abdomen. An irregular double row of brown spots on the thorax and abdomen, dorsad of the spiracles, which protrude slightly. Hairs, resembling trumpets, and called by Dr. Chapman trumpet-hairs,† scattered thickly on dorsum of head, and more sparingly on thorax and abdomen, here most numerous along the line of the spiracles. These hairs are quite small, appearing, with a low-power lens (x45), like minute tacks stuck into the skin.

Lycæna fulla Edw.

Lycæna fulla is the most abundant *Lycæna* occurring about Lake Tahoe. I discovered a female on July 8 ovipositing on *Lupinus meionanthus* Gray. On the 18th I took thirty eggs, sixteen of which were laid on

†Ent. Rec., XVII, 172, 322, ff.

the leaves, thirteen on the seed-pods, and one on the stem of the plant. These eggs hatched in about ten days, and the larvæ continued to feed until the second instar, when they stopped and hibernated until the following spring. I took a number of rather large larvæ of this species in August, and the only one that lived pupated in the later part of the month, and emerged the following spring. It is thus evident that, although the adults fly uninterruptedly from June until September, the species hibernates both in the pupal and larval conditions, and not improbably also in the egg stage. Apparently larvæ coming from eggs laid in the early summer pupate the same year, and hibernate thus, while those hatching later hibernate as larvæ. It is possible that some of the last eggs to be laid do not hatch until the following spring, though I did not observe this. A considerable number of the larvæ which I took had Tachinid eggs on them, but by removing these the larvæ were reared successfully. I also obtained a Braconid parasite in the spring from a larva which had hibernated.

The larvæ of *fulla* are attended by a small black ant. I often discovered larvæ by looking for these ants on the food-plant, for the larvæ themselves are very inconspicuous. The ants, as has been observed in the case of various Lycænids, by Edwards and others, obtain a liquid excreted by a gland on the 10th body segment of the larva, and in return probably afford the latter some protection. In fact Edwards† noted on one occasion an ant driving an ichneumon fly away from a larva. With *fulla* the Tachinid flies are probably not interfered with by the ants, as the flies lay their eggs on the larvæ in the first and second instars, while the ants do not pay much attention to the latter until they become larger. A pair of eversible sacs (Fig. 4) on the 11th segment is also made use of by the larvæ, either repelling or attracting the ants. Neither these sacs nor the gland on the 10th segment have been carefully studied. Several writers, however, have published descriptions of the external organs, in two or three cases accompanied by drawings. Little has apparently been done in the way of carefully observing the behaviour of the ants toward the larvæ, except by Edwards and one or two others.

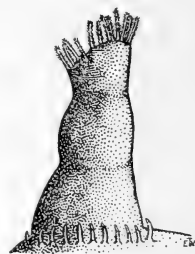


FIG. 4.—Eversible sac of larva of *Lycæna fulla*.

†Butt. N. A., ii, Lyc., II, p. 14; CAN. ENT., X, 135.

The larva, in escaping from the egg, eats an irregular hole in the top, and leaves the rest. The larva feeds by making pits in the leaves or seed-pods of its food-plant. My larvæ hibernated about the middle of August, some three weeks after hatching. I kept the larvæ over winter by placing them in a small tin box, which I put into a baking-powder can fastened outside a window, on the north side of the house (our winter storms come from the south). I previously punched holes in the bottom of the can, giving a free circulation of air, and yet keeping out the rain. In this way I succeeded in keeping alive practically all of the larvæ. The larvæ moulted the following spring from March 9th to 11th, bringing them into the third instar. About a month later they pupated, and the adults emerged at the end of two or three weeks. Thus the total time spent from the hatching of the larva to the appearance of the adult, not counting the six months of hibernation, is from 65 to 70 days. In moulting, the skin becomes loosened a segment at a time, from the posterior end forward. After a few minutes, a split appears cephalad, extends back and divides, forming a Y-shaped opening. Then the larva slowly crawls out, the old shell of the head falling off. As the larva comes out, the eversible sacs are extended; a skin apparently coming from them also.

Egg.—Diameter, 0.65 mm.; height, 0.25 mm. Of the ordinary Lycænid shape, covered with a raised network forming polygonal cells, each cell having a rounded process at each angle. Cells smallest about the base of the egg, becoming gradually larger at the sides, and again somewhat smaller about the micropyle, which is slightly depressed. Colour light pearly bluish-green, the network lighter.

Larva, First Instar.—Length, a little over 1 mm. Slug-shaped; yellowish-green; head black. A row of long, light brownish hairs on each side of dorsal line, from segments 2 to 11, one hair to a segment in each row, except segment 2, which has two hairs on each row. A secondary row of smaller hairs, laterad of each primary row, one hair to each row on segments 2 to 9. A number of irregularly placed hairs on first segment, about and on the cervical shield. A fringe of long hairs on lateral margin. Toward the end of the instar the body becomes darker green, with minute dark dots on dorsal surface, and the dorsal line dark green, with a light line on each side.

Second Instar.—Length, 3.75 mm. Colour silvery bluish-green dorsal line dark green; body surface scattered with minute dark dots, except along the dorsal line; some very indistinct oblique lateral dashes

and bands ; head rather small, nearly black. Hairs arranged as in preceding stage, with the addition of a long hair on each of segments 3 to 9, situated on the dorsal line, and a number of short hairs scattered over body.

Hibernating Larva.—Dull rose colour, with greenish showing through dorso-laterally ; cervical shield light yellowish, with a number of blackish tubercles ; ventral side light apple-green ; head shiny black.

Third Instar.—Length, 6–7 mm. Colour varying from dull rose to dull greenish, with indistinct oblique dorso-lateral dashes, and a dark dorsal line ; a light green line on each side of this, showing only on middle part of each segment ; also a whitish, or light pink, lateral line, with a pink or rose-coloured stripe below it, and sometimes one above ; ventral side bright green ; head shiny black. Dorsal hairs rather short, arising from translucent tubercles ; lateral hairs longer, ; both sets roughened and light brown. Black tubercles scattered over body, most of which give rise to short, curved, white hairs. Opening of gland on 10th segment surrounded by a ring of thick, blunt hairs. Eversible sacs on segment 11 very pale green, with a number of plumose hairs on tips (Fig. 4).

Fourth Instar.—Length, 9.5–10 mm. Dull grayish-green or dull claret ; median line deep claret, lateral line light pinkish, with a dull rose line above and below it, the former extending dorsad of the spiracles ; between this and the dorsal line two rows of oblique dashes, dull rose ; cervical shield grayish ; ventral side pale green ; claws of thoracic feet brown ; hooks on prolegs reddish-brown ; head shiny black. Body thickly scattered with tubercles, some nearly white, others black, the white ones most numerous. From these tubercles arise short, roughened light brownish hairs. Lateral fringe of hairs, and some on the first segment, longer, but dorsal rows of hairs scarcely distinguishable from the scattered ones. Some of the tubercles on each side of dorsum larger, forming a more or less distinct white line. Length, before pupation, 14 mm. ; width, 4.75 mm.

Pupa.—Length, 9.5–10.5 mm. ; width, 4.5–5 mm. Of the usual stout, *Lycænid* form. Colour at first bluish-green ; later, abdomen dull dirty greenish, with a dark dorsal stripe ; dorsum of thorax brighter green ; head greenish, with traces of brown markings ; wing-cases greenish-cream colour. Brown reticulations and spined hairs, chiefly about the head and lateral parts of abdomen, and visible with low-power lens.

NOTES ON DIABROTICA AND DESCRIPTIONS OF NEW SPECIES.

BY FRED. C. BOWDITCH, BROOKLINE, MASS.

(Continued from page 58.)

D. mapiriensis, n. sp.

Head and antennæ black; thorax olivaceous, tinged in front with piceous, shiny, bifoveate, scutel black; elytra castaneous green, thickly and coarsely punctate, rather opaque, strongly plicate, and with one or more longitudinal sulcations on the disk, three black spots at the base, one common sutural, the other humeral, all quadrate, the suture narrowly piceous until near the apex, also a round spot on the convexity, about equidistant between the margin and the suture; below prasinous, with black pectus; tibiæ and tarsi black or piceous. Length, 3 mm.

Ten examples, Mapiri, Bolivia.

Antennæ nearly as long as body in ♂, joints 2-3 short, equal, 4 longer than both preceding together, the basal joints a little tinged with piceous, thorax widest in front of the middle, and longer than broad, foveæ deep and well marked, the surface sparsely punctate; elytral punctures confluent in spots; and with the longitudinal sulcations showing in places almost as costæ; the sutural black lining has a tendency to increase in thickness between the apical spots. The most salient point for quickly recognizing this form is its small size, dull greenish colour, with two black spots behind, these being much more prominent casually than the front marks.

D. surinamensis, nov. sp.

Head piceous, with anterior face pale, antennæ pale fuscous, last three joints flavous, thorax pale flavous, smooth, convex, shining, impunctate, scutel black, elytra pale flavous, not placate, shining, with three basal vittæ, one sutural common, the other humeral, connected at the base, and an apical lunule on the convexity, concave behind, all black, below and legs pale flavous, with piceous pectus, tibiæ and tarsi dark yellow. Length, 6 mm.

One example, Surinam (orange label).

The clypeal ridge in front is almost wanting, the mouth tinged with piceous, the antennæ three-fourths as long as body, joint 2 short, 3 a trifle longer, 4 one-half longer than the two preceding, thorax broader than long, moderately sinuate behind; the basal vittæ reach the beginning of the median third of the elytra, are broad, and the humeral obliquely truncate,

March, 1911

upward to the scutel, the scutellar being wedge-shaped, the apical lunule ends at equal distance from the suture and margin; the punctuation is moderate and thick.

Very like some of the forms of *septemliturata* Er., but readily separated by the not plicate elytra.

D. clarkellita, nov. sp.

Head black, antennæ a little more than one-half length of the body, black, last two joints yellow, 2-3 short, nearly equal, 4 slightly longer than both together; thorax rufous, convex, smooth, shining, obsoletely bifoveate, scutel rufous; elytra honey-yellow, plicate, shining, with three short, broad, even cyaneous vittæ at the base, one common sutural, the other humeral, covering the anterior third, also on each elytra two similar spots at the rear, one nearly round median, the other sublateral oblong, both on the convexity; body below and legs yellow, pectus black. Length, $5\frac{1}{2}$ mm.

One example, St. Catharine, Brazil, sent me by Mr. Klages.

Will be placed near *dysoni* Baly, from which it is easily distinguished by the three short, even cyaneous vittæ in front, and the antennæ with last two joints yellow. The thorax is longer than broad, faintly sinuate, nearly parallel; the elytra are rather closely punctate, and have a tendency to be slightly corrugated, and the cyaneous vittæ at the base are not narrowed behind but are rather abruptly truncate.

D. lünderwaldti, nov. sp.

Form almost parallel, head black, antennæ black, with the three lower and two upper joints flavous; thorax pale flavous, convex, smooth (♂), impunctate on the disk, scutel black, elytra pale flavous, plicate, thickly, finely punctured, three spots at the base, one common sutural wedge-shaped, one humeral, the latter prolonged to a point just beyond the middle, and a large round spot near the apex black; below and legs flavous, pectus black. Length, $5\frac{1}{2}$ mm.

Two examples, St. Catarina, Lünderwaldt; one St. Catharine, Brazil, Klages.

The antennæ (♂) about three-fourths the length of the body, joints 2-3 equal, 4 one-third longer than the preceding two; in the ♀ antennæ 3 is longer than 2, and 4 equal the two preceding, the thorax is a little wider than long, sides nearly parallel, and with a few punctures at the sides; the plication of the elytra is strong and extends nearly to the convexity, the punctuation is thick and even, the reflexed edge is marked and wide, the sutural spot is about one-fourth of the length of the elytra, the

thorax in the Klages specimen which I regard as the ♀ is faintly bifoveate, the elytra are very slightly dilated behind, so the general appearance is parallel with two conspicuous black spots behind.

D. callangaensis, nov. sp.

Head black, antennæ dark fuscous, base and three apical joints pale, thorax pale rufous-flavous; shining, punctured, depressed, bifoviate, scutell flavous, elytra pallid yellow, obsoletely plicate, dilated behind, with a sublateral blue-black stripe from the shoulder, along the side for about two-thirds the elytra; the suture is also narrowly tinged with the same colour on the anterior half or two-thirds; below flavous, with pectus black; legs flavous, with dark fuscous tibiæ and tarsi. Length, $6\frac{1}{2}$ – $7\frac{1}{2}$ mm.

Five examples, Callanga and Vileanote? Peru.

The antennæ are more than three-fourths as long as the body, slender, joint 3 nearly one-half longer than 2, 4 equal to the two preceding, the four or five lower joints flavous, and the three upper ones, the extreme tip of the last excepted, pallid; the thorax is a little wider than long, the punctuation scattered but very obvious; the punctures of the elytra are fine and even.

Near *facialis* Baly, but smaller and more pallid.

D. neolineata, nov. sp.

Head flavous, labrum black, antennæ light yellow-fuscous, lightest at base and apex; thorax flavous-rufous, smooth, shining, depressed behind, and obsoletely bifoveate; scutell yellow, elytra pallid yellow, plicate, smooth and finely punctured; three longitudinal blue-black lines at the base, one sutural common, the other basal humeral, also two behind, one discal on the convexity, the other sublateral; below and legs pallid yellow, pectus black. Length, 5–6 mm.

Three examples, Mapiri, Bolivia.

I also place here three examples from Pachitea, Peru, which differ somewhat, but have the black labrum.

This species is very close to *brevilineata* Jac., from Bugaba and Bogota; the present species is, however, smaller, and the Mapiri form has the thorax very obsoletely foveate at the best, the antennæ are more wholly flavous, and the labrum is always black, whereas *brevilineata* has always a yellow labrum. The antennæ has joint two short, 3 one-half longer, 4 long as the two preceding. One of the Mapiri specimens has the humeral stripe elongated to the rear, indicating a form which may connect with the rear spot, but in the type the spot is short and humeral.

D. semisulcata, nov. sp.

Head black, antennæ slender, nearly as long as body, flavous, gradually darkening to joints 9-10, which are pale, 11 piceous; 2 short, 3 a trifle longer, 4 nearly twice as long as both preceding together; thorax about as broad as long, rufous, shining, convex, finely and sparsely punctate, an obsolete depression in front of the scutel, which is rufous; elytra flavous, shining, rather thickly and coarsely punctate, very strongly sulcate plicate, with a supplemental sulcation from the humerus over the disk, three spots at the base, one small wedge-shaped sutural, the other humeral, broad, extending to the middle; also two spots transversely parallel at the rear, one discal on the convexity, the other lateral, the latter in line with the humeral, all black, below and legs yellow, pectus black. Length, $6\frac{1}{2}$ mm.

One example, Peru, square, pale, olive-green label (Callanga?).

Will be placed in division O (Baly's paper); but is very distinct from any there mentioned; the sinuation of the thorax is slight, but the dilatation in front is marked, and the reflexed edge is very noticeable behind. The sutural black spot does not attain the base, and is drawn to a fine point at about one fourth the length of the elytra; the rear spots are both parallel to the suture; the plica extends from the shoulder to the rear outside spot, and takes the form of a deep groove.

D. bacri, nov. sp.

Head black, antennæ three-fourths as long as body, fulvous at base, last three joints (the upper half of last excepted) pale; thorax rufo-flavous, smooth, convex, bifoveate, scutel piceous, elytra shiny, obsoletely plicate, flavous, dilated behind, distinctly evenly punctured, with a thin, common scutellar line, a short humeral spot, a small median discal, and two small postmedian spots on the convexity, placed obliquely in the usual manner, black beneath and legs yellow, with pectus black, and tarsi tinged with piceous. Var. elytra with only the basal spots. Length, 7 mm.

Two examples, Rio Mixiollo, 1200 m., Prov. Huallaga, Peru, C. C. Baer, 7-8-1900.

The elytral markings would place this form somewhere near *apicicornis* Jac. = *palpalis* Jac., but the body is even more dilated than in the former. The joint 2 of the antennæ is short, 3 stout and barely one-half longer, 4 longer than the two preceding, 5-8 black; thorax is wider than long, barely depressed in front of the scutel, a few minute punctures at the lateral edges, which are moderately sinuate; the foveæ are well

impressed, though not very large ; the elytral punctures are everywhere distinct, but nowhere crowded ; the specimen I have marked var. shows the sulcation of the elytra more plainly and has a supplemental sulcation inside the shoulder over the disk ; the humeral spots are of uniform width and rather truncated, and cover hardly more than the shoulder knob ; the sutural line embraces the scutel, and is gradually drawn to a fine point at the middle of the elytra ; the basal spots are practically the same in both examples.

D. peruensis, nov. sp.

Head very dark piceous, antennæ a little more than one-half the length of the body, black, joints 2-3 and part of 4 ferruginous, 9-10 and base of 11 pale ; thorax rufous, convex, shiny, with a few scattered punctures, scutel piceous; elytra very obsoletely plicate, shining yellow, strongly and evenly punctured, three basilar spots, one wedge-shaped sutural, the others humeral and tapering to a point at the middle, and a heavy lunule on the convexity; concave behind, dark steel blue, beneath yellow, pectus, tibiæ and tarsi black. Length, $5\frac{1}{2}$ mm.

One example, Rio Mixiollo, 1200 m., Prov. Huallaga, Peru, C. Á. Baer, 7-8-1900,

I place also under this species another example from the same place, having two spots in place of the lunule, and the antennæ and feet lighter (immature?).

The antennæ are rather stout, the joint 2 short, 3 one-half longer, 4 as long as the two preceding ; the thoracic punctures are very fine and only visible with a strong lens ; the obsolete plication of the elytra is very slight, and at first I called the elytra not plicate, but at a certain angle a very slight plication is visible as a depressed or flattened space; the elytra are slightly dilated at the rear.

Would probably be placed near *dysoni* Baly, which I cannot satisfactorily identify with any of my forms.

D. rendalli, nov. sp.

Head black, antennæ three-fourths the length of the body, yellow, joints 5-8 running to piceous, joints 2-3 short, the latter a trifle the longer, and 4 equal the two preceding ; thorax yellow, rather shiny, depressed, trifoveate, the antescutellar fovea being transverse ; scutel yellow, elytra plicate, yellow, moderately coarsely and evenly punctate, a small common sutural line occupying the anterior fourth, and a sublateral line from the

humerus to about the end of the median third, black below and legs yellow, pectus black. Length, 5 mm.

Two examples, Caparo Valley, Pt. of Spain, 1-97, Dr. Rendall. One example, Trinidad.

Comes near *cavicollis* Baly. The piceous colour of the antennæ stops abruptly at the end of the eighth joint, the thorax is broader than long, with moderately sinuate sides, impunctate; elytra are dilated as in *cavicollis* Baly, and the colour and markings are just as in that species, but the antennæ and thorax are very different, and at once separate the two.

D. boggiani, nov. sp.

Head yellow, antennæ about one-half the length of the body, black, with the first three and last three joints pale; thorax yellow, shining, impunctate; scutel yellow, elytra pallid whitish-yellow, a common sutural line reaching the middle, a humeral sublateral stripe extending nearly to the apex, a discoidal stripe, abbreviated anteriorly just before the middle and posteriorly at the convexity, black, below and legs yellow, pectus black. Length, 5 mm.

One example, Pt.^o 14, de Mayo G. Boggiani, 1-1897 (Mus. Genova).

Near *kirbyi* Baly. The antennæ are stout, the fourth joint barely as long as the two preceding; the thorax is broader than long and only moderately sinuate behind; the elytra are not plicate, and the punctures are uncoloured and fine, so they are not at all prominent; the sutural line vanishes at the middle at a fine point; the sublateral line is, however, of the same width until it ends just before reaching the suture; the general form is almost parallel.

D. clio, nov. sp.

Head bright yellow, labrum piceous, eyes black, antennæ short and stout, barely one-half the length of the body, black, with basal joint flavous, tinged with piceous, and last joint piceous-flavous; joint 2 short, 3 one-half longer, 4 barely equal to two preceding; thorax bright yellow, convex, shining, deeply bifoveate and a slight antescutellar depression, scutel concolorous with thorax; elytra not plicate, pallid whitish-yellow, with moderately thick, fine, piceous punctures, a narrow sutural line almost attaining the apex, a sublateral humeral stripe nearly attaining the apex, and a discoidal stripe, beginning just before the middle and passing the convexity, black, below and feet yellow, pectus black. Length, 4½ mm.

One example, Rio Nobilecchi Luglio, 1897, G. Boggiani (Mus. Genova).

I place this near *kirbyi* Baly, though the long sutural line indicates a relationship with *submarginata* Baly; the relative lengths of the second and third antennal joints to the fourth would almost place this form in §2, but it is otherwise so like the allies of *kirbyi* that I have placed it here; the thorax is a trifle broader than long, moderately sinuate; elytra slightly dilated behind, shining, with the punctures showing as fine piceous points; the sutural line is very fine except in front, but the other stripes are of the same width throughout.

D. juncto-linea, nov. sp.

Head black, antennæ one-half the length of the body, black, somewhat piceous at base, joints 9-10 and basal half of 11 white; thorax broader than long, pallid yellow, depressed, and obsoletely bifoveate; scutel black; elytra pallid, almost white, the suture narrowly, anteriorly, the basal margin and a sublateral vitta from the base to the turn of the convexity, as well as a discoidal vitta, abbreviated before and behind, brilliant blue-black; body below and legs pallid, with the pectus, tibiæ and tarsi black. Length, $5\frac{1}{2}$ mm.

One example, Caracas, Venez. (yellow label).

Close to *nigrolineata* Jac., from Central America. My seven specimens of this species (including the type) have the sublateral vitta extended to the suture, which is narrowly black for its whole length, and the discoidal vitta almost connected with the basal black margin; *juncto-linea* has the sublateral stripe only as far as the middle of the convexity, the discoidal stripe occupies about the middle two-fourths of the elytra, and the suture is black only for about one-third of the anterior portion; the antennæ are darker and the elytra smoother and less evidently punctate, joint 2 of the antennæ is short, 3 one-half longer, 4 equal the two preceding. The general appearance is that of *Neobrotica oberthuri* Baly.

D. underwoodi, nov. sp.

Head black, antennæ about three-fourths the length of the body, light piceous, the first four or five joints and the last three pale; thorax pale rufous, smooth, shining, bifoveate; scutel piceous; elytra plicate, pallid-yellow, the anterior third of the suture narrowly, a sublateral humeral stripe half rounding the convexity, and a discoidal stripe abbreviated shortly before the base and at the convexity black; body beneath and legs yellow, pectus black. Length, $6\frac{1}{2}$ mm.

Two examples, San José, Costa Rica (Underwood).

This species is close to *nigrolimbata* Jac.; one of my two examples being so labelled by Jacoby, but it is abundantly distinct, the lateral vitta does not attain the suture, there is no narrow cross basal vitta joining the two lateral stripes, and the sutural mark is much shorter, also the legs are entirely flavous, the punctuation and plication is the same; one example has the discal stripe interrupted at the middle.

D. bakeri, nov. sp.

Head yellow, labrum piceous, antennæ more than one-half length of body, black, joints 1-3 flavous, 9-10 pallid; thorax wider than long, yellow, convex, shining, scutel yellow, elytra yellow, plicate, thickly and rather coarsely punctured; body below and legs yellow, pectus, tibiæ and tarsi black. Length, 6-6½ mm.

Twelve examples, Para, Brazil (C. F. Baker).

Seems to be near *asignata* Baly (which I have not seen), but that species is said to have the elytra *not* plicate, the reverse of *bakeri*. The joint 2 of the antennæ is short, 3 not one-half longer, 4 slightly longer than the two preceding, the three lower joints are more or less tinged with piceous, and the base of 11 is pale; some examples show an obsolete fovea on the thorax and about two or three obsolete longitudinal sulcations on the disk of the elytra.

D. chacoensis, nov. sp.

Head, thorax, scutel and elytra dull blue-black; antennæ prasinous, with last four joints flavous; the thorax smooth, depressed and semi-shining, bifoveate, with a few fine punctures at the sides; elytra with about nine elevated costæ, vague at base and apex, the whole surface, including the costæ, punctured; anus and last segment of abdomen rufous; body below black, abdominal segments fringed with golden pubescence, sides of the breast clothed with golden-sanguineous hair, feet prasinous, tibiæ and tarsi dark black-green. Length, 8½ mm.

Two examples, Chaco, Bolivia.

Should be placed in § 5, Baly's paper. Joints 2-3 of the antennæ are very short and equal, the latter being more obconic (♂), 4 twice as long as both preceding (♂), joint 3 in ♀ is one-half longer than 2, and 4 a little longer than the preceding two; the eighth joint is pale flavous and the last three sanguineous; the thorax is about square, with a dull smooth finish, with fine scattered punctures; the costate elytra and red anus at once distinguish this form from anything else, the nearest, perhaps, being

variolosa Jac.; the colour of the tibiæ and tarsi is obscured by the thick sericeous pubescence, the last joint of the tarsi is sanguineous.

D. pachitensis, nov. sp.

Head black, antennæ fuscous-flavous, joints 9-10 white; thorax fuscous-flavous, transverse, punctate, trifoveate, scutel black, elytra fuscous-flavous, obsoletely plicate, coarsely and confluent punctured, each with three black stripes, a common sutural, a median discal and a humeral sublateral, all end at or just after the middle; body beneath and legs flavous, pectus black. Length, $5\frac{1}{2}$ -6 mm.

Two examples, Pachitea, Peru.

Antennæ (♂) longer than the body, joints 2-3 very short and about equal, 4 twice as long as the preceding two; thorax broader than long, the punctures quite coarse at the sides, the third fovea being longitudinal before the scutel, sides almost parallel; elytra strongly dilated behind, the punctuation being much less evident at the rear, strong and coarse anteriorly; the humeral stripe is truncated behind, shorter than the others and ends about the middle; the other stripes are gradually drawn out, and end at or about the convexity; all, with the exception of the sutural, are about equal in width throughout their length; the sutural is, however, broader anteriorly; the five black stripes, two on each elytra and one common sutural, easily separate this form.

D. atrobasis, nov. sp.

Head rufous, labrum black, antennæ nearly as long as body, black, with the last three and one-half joints pallid; thorax rufous, depressed, bifoveate; scutel black; elytra pallid-yellow, with the anterior third occupied by a large quadrate black spot, which does not attain the lateral margin; body beneath, except the thorax, black; legs black, femora with base and apex yellow. Length, 4 mm.

Two examples, green label (Marcapata?).

Antennæ with joint 2 short, 3 one-half longer, 4 equal two preceding; thorax a little wider than long, finely punctate, sides feebly sinuate; elytra not plicate, slightly depressed back of scutel, very finely and not thickly punctured, the rear of the black mark almost truncate, but a little drawn down at the suture, the spot extending entirely across the elytra, omitting the lateral inflexed margin and a rear corner on the outside, which is rounded.

Judging by the description and figure, the species has a general resemblance to *bicolor* Jac., from Nicaragua.

THE LITHOBIOMORPHA OF WISCONSIN AND NEIGHBOURING STATES.

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This paper is based primarily upon collections made by the author in Nebraska, Iowa, Illinois, Wisconsin and Peninsular Michigan during a brief trip through these States in the early part of the summer of 1910. The excessive dryness of the season in this section of the country was very unfavourable for the collecting of chilopods and diplopods. The species reported from Indiana and Minnesota by Bollman have been included. Specimens of all but a few of the forms previously recorded from the States mentioned, as well as a number which are new, were obtained by the author. The new locality records give a clearer knowledge of the distribution of a number of species. The key to species of *Lithobius* is intended to include all those now known to occur within the region above indicated.

Family HENICOPIDÆ.

This family is represented in this region by but one species—*Lamyctes fulvicornis* Meinert.

Lamyctes fulvicornis Meinert.

The many specimens secured seemed to agree fully with the European form.

Localities.—Omaha, Neb.; Peoria, Ill.; Haugen, Eau Claire, Ashland, Marinette and Beloit, Wis.; Watersmeet, Powers and Menominee, Mich. Also reported from Winona, Minn.

Family LITHOBIIDÆ.

Of this family the genera *Lithobius* and *Bothropolys* are represented. Species conforming to *Monotarsobius*, as defined by Verhoeff, do not occur among those thus far known from the region.

Genus *Bothropolys* Wood.

But one species of this genus has been found within these States.

Bothropolys multidentatus (Newport).

One of the most abundant and widespread of the North American Lithobiomorpha.

Localities.—Franklin Grove and Peoria, Ill.; Ann Arbor, Mich. Also reported as occurring throughout Indiana, and at Ludington, Mich. March, 1911

Probably will be found within Wisconsin, where, however, the excessive abundance of *L. forficatus* doubtless militates against it.

Genus *Lithobius* Leach.

KEY TO SPECIES.

- a. Posterior angles of the 7th, 9th, 11th and 13th dorsal plates produced. (*Neolithobius*.)
 - b. Claw of the anal legs not armed at base.
 - c. Claw of the penult legs unarmed,
 - Articles of antennæ 30-40; prosternal teeth 5+5 to 7+7; spines of first legs 2, 2, 1-3, 3, 2; of penult legs 1, 3, 3, 2.....*L. mordax* Koch.
 - cc. Claw of the penult legs armed with one spine.
 - Articles of antennæ 31-36; prosternal teeth, 6+6 to 8+8; spines of first legs 1, 2, 1 to 2, 2, 1; of penult legs 1, 3, 3, 1-1, 3, 3, 2....*L. tyrannus* Bollman.
 - bb. Claw of the anal legs armed with one spine.
 - c. Claw of penult legs armed with one spine.
 - Articles of antennæ 31-32; prosternal teeth 2+2; spines of first legs 1, 1, 1; of the penult, 1, 3, 3, 1.....*L. juvenus* Bollman.
- aa. Posterior angles of the 9th, 11th and 13th dorsal plates produced. (*Lithobius* s. str.)
 - b. Claw of anal legs unarmed.
 - c. Claw of penult legs unarmed.
 - Prosternal teeth 3-3; articles of antennæ 20-21; spines of penult legs 1, 3, 3, 2; of anal 1, 3, 2, 0; claw of female gonopods entire....*L. sexdentatus* Kenyon.
 - cc. Claw of penult legs armed with one spine.
 - d. Articles of antennæ 20, or near that number.
 - Prosternal teeth 3+3; spines of first legs 2, 3, 2; of anal, 1, 3, 3, 1.....*L. howei* Bollman.
 - dd. Articles of antennæ 30 or above.
 - e. Coxal pores transverse; spines of first legs 2, 3, 2.....*L. forficatus* Linn.
 - ee. Coxal pores round; spines of first legs 1, 2, 1-2, 2, 1.....*L. celer* Bollman.

- bb. Claw of the anal legs armed with one spine.
- c. Claw of the penult legs armed with one spine.
 Spines of first legs 1, 3, 2 ; of penult, 1, 3, 3, 1 ; of anal, 1, 3, 2, 1 ; length, 8-11 mm. . . . *L. politus* McNeil.
- cc. Claw of penult legs armed with two spines.
 Spines of first legs 1, 3, 1-2, 3, 1 ; of penult, 1, 3, 3, 2 ; of anal, 1, 3, 2, 0 *L. numius*, sp. nov.
- bbb. Claw of anal legs armed with two spines.
- c. Claw of penult legs armed with two spines.
 Prosternal teeth 3 + 3 ; articles of antennæ 20 ; spines of penult legs 1, 3, 3, 2 ; of anal, 1, 3, 2, 1 ; coxal pores round, 3, 4, 5, 3 *L. bius*, sp. nov.
- aaa. Posterior angles of none of the dorsal plates produced. (*Metalithobius* aut.)
- b. Claw of anal legs unarmed.
- c. Claw of penult legs armed with two spines.
- d. Claw of gonopods of female entire.
- e. Articles of antennæ 20-23 ; prosternal teeth 2 + 2 to 4 + 4.
- f. Spines of penult legs 1, 3, 3, 1 ; of anal, 1, 3, 2, 0 ; anal legs of male with 3rd and 4th joints produced mesad into conspicuous lobes, the corresponding joints in female also usually bearing lobes *L. bilabiatus* Wood.
- ff. Spines of penult legs 1, 3, 3, 2 ; of anal, 1, 3, 3, 1 ; 3rd and 4th joints of anal legs not thus produced into lobes, the 5th joint in some males with a small keel at distal end dorsad *L. jowensis* Meinert.
- ee. Articles of antennæ 24-29 ; prosternal teeth 5 + 5 to 6 + 6 *L. providens* Bollman.
- dd. Claw of gonopods of female tripartite.
- e. Length, 9-11 mm *L. pullus* Bollman.
- ee. Length, 15 mm. or above.

- f. Articles of antennæ 23-32 ; spines of first legs, 2, 3, 2 ; of penult legs 1, 3, 3, 2 *L. holzingeri* Bollman.
- ff. Articles of antennæ 20 ; spines of first legs 1, 3, 2 ; of penult legs 1, 3, 3, 1 *L. minnesotæ* Bollman.
- bb. Claw of anal legs armed with one spine.
- c. Articles of antennæ 20.
Spines of first legs 1, 3, 1 ; ocelli, 18-25 ; length, 10-12 mm. *L. trilobus* Bollman.
- cc. Articles of antennæ 25-32.
- d. Spines of first legs 0, 0, 1 *L. exiguus* Meinert.
- dd. Spines of first legs 0, 1, 1-1, 2, 1. *L. tivius* Chamberlin.
- bbb. Claw of anal legs armed with three spines.
- c. Claw of penult legs armed with two spines.
Articles of antennæ 20-31 ; spines of first legs 2, 3, 2 ; of penult legs 1, 3, 3, 1 ; of anal legs 1, 3, 3, 1-1, 3, 3, 2 ; length, 6-9 mm. *L. cardinalis* Bollman.

1. *Lithobius mordax* Koch.

A species abundant in the south and south-east.

Localities.—Tama, Iowa (common) ; Wisconsin (one young male, probably this species) ; Nebraska (Kenyon). Also reported from Winona, Minn. In 1887 Bollman reported the form from Indiana, but the following year eliminated it from the State list, referring the specimens which he had to the following species :

2. *Lithobius tyrannus* Bollman.

Localities.—Reported as common in Indiana at Bloomington, La Fayette, Greencastle, Salem, New Providence.

3. *Lithobius juvenus* Bollman.

Locality.—Bloomington, Indiana.

4. *Lithobius howei* Bollman.

Localities.—Reported from Ft. Snelling and Winona, Minn., and from Bloomington, Kokoma and Dublin, Indiana.

Lithobius forficatus (Linnæus).

The most common chilopod in the northern sections of the United States. It is exceptionally abundant throughout Wisconsin.

Localities.—Peoria, East Peoria, Franklin Grove, Dwight and Sterling, Ill.; Mongona, Boone, DeWitt, Marshalltown, Tama and Ogden, Iowa; Kimball's, Fond du Lac, Marinette, Eau Claire, Haugen, Devil's Lake, Janesville, Ashland and Beloit, Wisconsin; Ann Arbor, Watersmeet, Powers and Menominee, Michigan. Also reported from Winona, Minn. (common), and from Lawrenceburgh, Greencastle, Connersville, Westfield and Bloomington, Indiana (common in northern section).

6. *Lithobius celer* Bollman.

Localities.—A specimen from Michigan and one from Wisconsin are referred provisionally to this species. There is considerable doubt as to their position. Both are not fully-grown males.

7. *Lithobius numius*, sp. nov.

Angles of the 9th, 11th and 13th dorsal plates produced, those of the 7th plate also slightly extended.

Antennæ with 20 articles.

Prosternal teeth 2 + 2.

Last two pairs of coxæ laterally armed, last three pairs dorsally armed.

Spines of the first legs 1, 3, 1-2, 3, 1; spines of the penult legs 1, 3, 3, 2, the claw armed with two spines; spines of anal legs 1, 3, 2, 0, the claw armed with one spine.

Coxal pores round, 3, 5, 5, 5.

Gonopods of female with the claw tripartite or almost bipartite through the pronounced reduction or almost obliteration of one tooth; spines 2 + 2.

Length, 11 mm.

Locality.—Haugen, Wisconsin.

8. *Lithobius bius* sp. nov.

Angles of the 9th, 11th and 13th dorsal plates produced.

Antennæ with 20 articles.

Prosternal teeth 3 + 3.

Last three pairs of coxæ laterally armed; last four pairs armed dorsally.

Spines of first legs 1, 3, 2; of penult legs 1, 3, 3, 2, the claw armed with two spines; spines of the anal legs 1, 3, 2, 1, the claw armed with two spines.

Coxal pores small, round, 3, 4, 5, 3.

Length, 13 mm.

Locality.—Saunders, Michigan.

9. *Lithobius sexdentatus* Kenyon.

Locality.—Sioux Co., Nebraska (Kenyon).

10. *Lithobius politus* McNeil.

Localities.—Peoria, Ill. Previously reported from Ludington, Mich., and from Bloomington and Dublin, Indiana.

11. *Lithobius cardinalis* Bollman.

Localities.—Reported from Bloomington, Westfield, Salem and New Providence, Indiana.

12. *Lithobius bilabiatu*s Wood.

Syn. *L. tuber* Bollman, Proc. U. S. N. M., 1887.

L. malterris Kenyon, CANADIAN ENTOMOLOGIST, 1893.

Localities.—Grand Island, Neb.; DeWitt and Tama, Iowa; Rock Island and East Peoria, Ill.; Devil's Lake, Wisconsin. Also reported from Winona, Minn., and from Bloomington, Indiana.

13. *Lithobius jowensis* Meinert.

Syn. *L. bilabiatu*s Bollman, Proc. U. S. N. M., 1887.

L. bruneri Kenyon, CANAD. ENT., 1893.

A very common species throughout the region.

Localities.—Omaha and Fremont, Nebraska; Mongona, Boone and DeWitt, Iowa; Rock Is., Franklin Grove, Sterling, Peoria and East Peoria, Ill.; Watersmeet, Saunders and Menominee, Michigan; Haugen, Marinette and Beloit, Wisconsin. Reported also from Ludington, Mich., and from Bloomington, LaFayette, Richmond, Greencastle, Salem, New Providence and Wyandotte, Indiana.

14. *Lithobius proridens* Bollman.

Localities.—Reported from Bloomington, LaFayette, Richmond, Brookville, Salem, New Providence and Wyandotte, Indiana.

15. *Lithobius pullu*s Bollman.

? Syn. *L. dorsospinorum* Kenyon, CANAD. ENT., 1893.

Localities.—Dwight, Ill. Also reported from Nebraska and from Bloomington, Indiana.

16. *Lithobius holzingeri* Bollman.

Localities.—Devil's Lake, Wisconsin. Also reported from Winona, Minn. (common).

17. *Lithobius minnesotæ* Bollman.

Localities.—Haugen, Wisconsin. Reported from Ft. Snelling, Minn.

18. *Lithobius trilobus* Bollman.

Localities.—Reported from Bloomington and Salem, Indiana.

19. *Lithobius exiguus* Meinert.

Localities.—Columbus, Neb.; Mongona, Boone, Marshalltown, Iowa; Peoria, Dwight, Sterling, Ill.; Janesville and Beloit, Wisconsin.

20. *Lithobius tivius* Chamberlin.

Localities.—Fremont and Omaha, Nebraska.

The specimens present slight differences from typical *tivius*, but probably represent the same species.

HABITS OF *SMERINTHUS GEMINATUS* SAY, AND *S. CERISYI* KIRBY.

I have sometimes taken the above two species here, night after night, in about equal numbers, "playing" over water. The habit is a peculiar one, which I have not noticed in any other species. I sometimes find them singly, and sometimes five or six together, flying to and fro, close to the water at open places between the willows, in a creek which runs through my place, generally at places where the banks have been worn down by stock crossing. Their motion is not regular, as in the *Hepialidæ*, but varied and meandering, usually over an area of about 20 feet square or less. So close do they fly to the water, that in striking at them with the net I often splash in mud and water. Though they generally vary their flight a few feet if a net is thrown close to them, they are not easily driven away unless actually struck at and missed, and not always then. The flight lasts about half or three-quarters of an hour, commencing in late dusk, and lasting for some time. Often I have to use a lantern to see to catch them. If a light is shown too close to them, they just move away a few feet, as they do from the net. All I have caught in this manner have been males, but their behaviour has not suggested an assemblage to females. Nor do they seem to be drinking, as I very rarely see one dip. Mr. G. O. Day, of Duncans, B. C., tells me that his son mentions having noticed the habit in *cerisyi*. F. H. WOLLEY DOD, Millarville, Alberta.

INSECTS AND DISEASE.

"THE PREVENTION OF MALARIA," by Ronald Ross, with contributions by other authorities. XIII—669 pp., with plates. (London: John Murray.)

INSECTS AND DISEASE," by R. W. Doane. XIV—227 pp., 112 figs. (American Nature Series, New York: Henry Holt & Company.)

If the goal of civilization is the supremacy of man over the antagonistic forces of nature, then the part which the entomologist is playing in enabling the human race to reach that goal is no small one. No other branch of entomological study has drawn the attention of men, and in particular of statesmen, to the importance which insects play in the economy of mankind, as that which deals with the direct relationship of insects to man as the carriers of disease. When an insect-borne disease is responsible in India alone for an annual mortality of over a million people, when another exacts a penalty of fifty thousand lives from the French as a toll for cutting a portion of the Panama canal, and a third disease in a few years results in the loss of over two hundred thousand lives in Central Africa, it is then that the importance of insects, as the necessary hosts of such diseases as Malaria, Yellow Fever and Sleeping Sickness, is recognized. At the anniversary meeting of the Royal Society, held in December, Lord Robson gave an indication of the forcible manner in which these questions are appealing to men of to-day. He remarked that it is the man of science who is to decide the fate of the tropics, not the soldier or the statesman with his programmes and perorations, but the quiet entomologist. He is the man of science who above all others strikes popular imagination the least and gets less of popular prestige, but he has begun a fascinating campaign for the sanitary conquest of those enormous tracts of the earth, and before long he will have added their intensely fertile soil, almost as a free gift, to the productive resources of the human race. Coming from one who is not a scientist, this statement is all the more significant of the trend of opinion among our public men. The mosquito is shown to be the factor which has prevented the opening up of enormous areas of Africa, and likewise the tse-tse fly by its attacks upon domestic beasts of burden; the flea is proven to be the means of disseminating the plague bacillus; the house-fly is condemned as a serious menace to public health as a carrier of the germs of typhoid and other infectious diseases, and so the story is

continued, the commonest creatures in our midst are proving to be our greatest enemies.

Laveran's discovery of the parasitic organism of malaria in 1880, and the subsequent demonstration seventeen years later by Ross of the part played by the mosquito in its transmission, have, as Prof. Osler has said, "a greater significance for a greater number of persons than any single observation made in connection with disease." The treatment for a subject whose literature stretches back over a period of more than two thousand years, would be an enormous undertaking, and the first of the two books under review does not attempt it. It treats of the prevention of the disease, based on the investigations which have been carried on in malarial regions since the author's discovery of the part which the mosquito plays. A brief history is given of the disease, and of the facts concerning its etiology as a necessary preliminary to a proper consideration of the prophylactic measures with which the volume is chiefly concerned. The various antipaludic measures are discussed and compared as employed in different regions of the world, and the results are given. The author has included contributions by twenty-one other experts on antipaludic measures in different countries, among which those of Dr. Howard on the work in the United States, and of Col. Gorgas on malaria prevention on the Isthmus of Panama, are of special interest. Coming from the pen of one who has rightly received the highest honours as an investigator, and as an authority on antipaludic measures, one would expect such a volume to be of singular merit, and we find that not only are our anticipations fully realized, but that the lucidity of the scientific details is made all the more attractive by the author's power of literary expression, thereby increasing to no small degree the circle of readers to whom the work will appeal.

The second volume is "a popular account of the way in which insects may spread or cause some of our common diseases," and as such will be of real service in explaining to the general reader the more important facts concerning the relations of such insects as mosquitoes, house-flies, fleas and others to human disease. It is extremely readable, and has the advantage over many of the popular accounts which find their way into print of having been written by one who is qualified by acquaintance with the facts to write such an account. While the value of the work is certainly enhanced by the inclusion of so many original photographs, a little more care might have been taken concerning them.

Some idea should have been given as to the relative size of Figures 22 and 23, and it would appear that Figures 53, 55, 56, 57, 59 and 61 are rather needless repetition of what might well have been illustrated in one or two good photographs. Figure 64 is inverted. Of the mistakes in the letterpress, we notice (p. 64) "the larvæ (of *M. domestica*) will become fully developed in from eight to fourteen days"; the minimum period for the larval stadium is about five days; and should not "responds to," on p. 82, line 7, be "records"? The seta of the flagellum of the antenna respond to the note, and this response is probably interpreted by the characteristic nerve-end cells in the swollen base of the antenna.

C. GORDON HEWITT.

BOOK NOTICES.

COLEOPTERORUM CATALOGUS, pars 23, Cleridæ. Sigm. Schenkling, Berlin. W. Junk, Nov., 1910.

This valuable contribution by the recognized authority on the subject is fully up to the high standard established by the author in his masterly work on the family in the "Genera Insectorum."

In the first general catalogue of Coleoptera, that of Gemminger and Harold (1869), only 697 species of Cleridæ were listed; in Lohde's "Cleridarum Catalogus" (1900), the number was increased to 1,822; and in the "Genera Insectorum" (1903), the number recorded was 1,971 species, exclusive of 187 varieties, 162 genera being necessary for their reception. In the present "Catalogus" 2,285 species, 224 named varieties and 185 genera are given as valid, the whole making a volume of 174 pages, of which 39 are devoted to a comprehensive index.

The system followed is essentially that of Lacordaire, with numerous modifications and amplifications. The family is primarily divided into two subfamilies—the CLERINÆ taking the place of Lacordaire's *Clérides vrais*, the CORYNETINÆ that of his *Enopliides*.

The genera are arranged in natural sequence, while the species are given in alphabetical order. The bibliographical and synonymical references, both generic and specific, are quite exhaustive, including those of a biologic and anatomic nature, and the general distribution of each species is also given.

Twenty-seven genera are recognized as members of our fauna, *Laricobius* Rosenhauer being properly omitted from the catalogue, as the

general consensus of opinion is that it should be placed in the family Derodontidæ. Some of the more important nomenclatorial changes noted are as follows: *Monophylla* Spin. takes the place of *Macrotelus* Klug; our two species of *Colyphus* (*furcatus* Schaeff. and *melanopterus* Dury) are referred to *Derestenus* Chevr.; *Tarsostenus* Spin. and *Phyllobænus* Spin. are removed from the subfamily CLERINÆ and assigned to the subfamily CORYNETINÆ. *Clerus* Fabr. is retained for the American species, usually known as such, but for which Prof. Chas. J. Gahan proposed the name *Enoclerus*, our species not being congeneric with the type of *Clerus*—the European *C. mutillarius*.

The letterpress is excellent; the mistakes are few and mainly unimportant, several of these being clearly chargeable to the typographer.

A. B. WOLCOTT.

MEIGEN 1800 ONCE MORE.

The supreme importance of the subject in the nomenclature of Diptera seems to justify a further comment on my part, although the mere difference of view between Mr. Coquillett and myself would not in itself require notice.

The decision of the Commission is that Meigen 1800 was actually published, therefore available if "found valid." Mr. Coquillett omits the word "found," which, to my mind, changes the meaning somewhat. The process of "finding" is what Mr. Stiles leaves to specialists, and as far as I am eligible to express an opinion under that head, I have already indicated that I have no use for Meigen 1800. I have had considerable correspondence with the publishing dipterists of the country in the last few weeks on the subject, and I have yet to find a single one of them who agrees with Mr. Coquillett, that Meigen 1800 should be allowed to take precedence over Meigen 1803.

To illustrate the point that there is a good deal at stake, I might mention Mr. Coquillett's two papers on the types of genera in Empididæ. About seven years ago he published a paper on the subject, applying the rules of the International Zoological Congress; lately, in his work on the types of all the North American genera of Diptera, he necessarily passed over the same field again, this time adopting Meigen's 1800 names. I have taken the trouble to count up the North American species of Empididæ that have their generic names changed in the later paper, and I find that they comprise no less than *forty-five per cent.* of the family!

J. M. ALDRICH, Moscow, Idaho.

ERRATUM.—CAN. ENT., XLIII, p. 51, line 4, for "*le long du*" read "*longe le.*"

Mailed March 11th, 1911.

The Canadian Entomologist.

VOL. XLIII.

LONDON, APRIL, 1911.

No. 4

BEETLES FOUND ABOUT FOLIAGE.

BY F. J. A. MORRIS, TRINITY COLLEGE SCHOOL, PORT HOPE, ONT.

During my five years or more of collecting, I have captured, on and about foliage, species belonging to eight or ten of the great families of beetles. Some of these have been merely incidental, and I know of nothing in their habits to connect them with the tree or herbaceous plant on which I found them. For instance, there is a species of Lagriid, a family closely related to the Tenebrionidæ or Darkling beetles, which I have often taken on foliage—*Arthromacra ænea*; usually the beetle is found feeding in blossoms of the dogwood, occasionally on the foliage of that shrub, but quite often I have seen it on the leaves of the May-apple (*Podophyllum peltatum*), the New Jersey Tea (*Ceanothus americanus*), and the Sweet Fern (*Comptonia asplenifolia*); it appears to have a special fondness for this last shrub, and on bright, hot days of July, is often abundant in patches of Sweet Fern.

So far as I know, it does not eat the leaves, but, contrary to the general habit of the Tenebrionids, it certainly courts bright sunshine. There is an allied genus in Great Britain (*Lagria hirta*) said to be found on blossoms and in hedges, which, even in the larval stage, is remarkable for its habit of wandering openly about foliage. Most of the Tenebrionid larvæ feed obscurely on vegetable matter, preferably in a dry condition; probably the best known—in domestic economy—is *Tenebrio molitor*, the famous meal-worm, which I have occasionally had served to me at breakfast in a plate of porridge.

There are three families of beetles in particular, many of whose members are extremely fond of sunshine. The Elaters or Click Beetles, their next of kin, the Buprestids or Metallic Wood-borers, and the Cerambycidæ or Long-horns.

I have often captured some of the smaller species of Elaters, chiefly of the genus *Corymbites*, resting on the upper side of leaves, apparently indulging in the luxury of a sun-bath. Early in May two seasons ago I

took a magnificent specimen of *Buprestis striata* basking on the tip of a branch of white pine, and in August of the same year I saw darting about in the mid-day heat and settling from time to time on the foliage of a spruce the gorgeous little Buprestid, *Chrysobothris harrisii*. This dazzling vision in peacock-blue was vouchsafed to me for a moment only and then withdrawn, but in my mind's eye I have been "following the gleam" ever since. Altogether that proved a red-letter day in my calendar, for I captured on the trunk of a newly-felled balsam fir at the same spot my sole specimen of *Monohammus marmorator*.

A great many of the Cerambycidæ or Long-horns are fond of this sun-basking; and I have made occasional captures on foliage of species that usually seek the shade; once a specimen of *Callidium antennatum* on a blade of grass by the roadside, and once a fine specimen of *Calloides nobilis* on a stalk of sedge by the railway track. But of those that are active by day, many of them feeding in blossoms, I have found many species on leaves, especially of the two tribes *Clytini* and *Lepturini*; in one or two cases the insect seems to prefer one foliage to all others, and perhaps such captures ought not to be regarded as merely incidental; for instance, I have found *Clytanthus ruricola* show a decided preference for the leaves of the thimbleberry, though it does not often feed in the blossom of this plant.

The capture I look back upon with greatest pride was that of a small specimen of *Eupogonius subarmatus* in my first season of collecting. I was going through a belt of basswood on the lookout for various things, but chiefly "Walking Sticks" and the larvæ of *Chrysomela scalaris*; by "Walking Sticks" I mean the Phasmid, *Diapheromera femorata*, an Orthopterous insect next of kin to the Praying Mantids; it occurred not infrequently that season about the Rideau on basswood; still more abundant on basswood leaves were the larvæ of *Chrysomela scalaris*, and I was rearing some in captivity. While scanning the under side of the foliage just above my head I noticed a leaf through which the sunlight passed imperfectly; there was a small opaque area near the leaf; in short, something rather smaller than a housefly was casting its shadow on the upper surface. I drew the leaf cautiously down and surprised a diminutive longicorn sunning itself in the middle of the leaf; unfortunately, I surprised it in more senses than one, for, in response to a stimulus of self-preservation, it instantly collapsed, and tumbling down the leaf in a series

of somersaults, like the clown in a pantomime, disappeared from the stage. For nearly half an hour I hunted among the *debris* at my feet, and at last discovered the little harlequin playing 'possum under a twig.

At first I took this beetle for *Amphionycha flammata*, to which superficially it bears an extraordinary resemblance; but I found the unguis or claws (which are divaricate) simple instead of cleft; as they are distinctly cleft in *Amphionycha*, the foot appearing to end in four minute claws, it became certain my capture was *Eupogonius subarmatus*.

Another form of incidental capture is where beetles of a carnivorous habit resort to foliage in search of food. I have once taken *Calosoma scrutator*, and several times *Calosoma calidum* on the foliage of the white pine; these enterprising ground beetles poaching on the arboreal preserves for caterpillars; many of the diurnal fireflies, which are carnivorous, may be found resorting to foliage for the same purpose, and the *Coccinellidæ* or Lady-birds are regularly so taken. One July I found two or three species of Lady-bird resorting in large numbers to an asparagus bed, where they were doing yeoman service in devouring larvæ as they fed on the foliage; on the *menu* of their banquet, if not the *pièce de resistance*, was *Crioceris asparagi*, and they were feasting royally.

Passing from incidental captures to those where the insect was found on its food-plant, I shall begin with an insect I saw in July three years ago, which did not devour the leaves, but using its jaws as a pair of scissors, cut them and rolled them up into cylinders. I mean the weevil, *Attelabus analis*, the oak-leaf roller.

I was examining the leaves of various plants, herbaceous and woody, along the railway track, some 12 miles north of Port Hope—especially willow shrubs and oak-seedlings whose foliage was lush and tender, the leaves being, many of them, still pink and soft—when I noticed a curculio with black head and snout, the thorax and elytra of a shining chestnut-red. I recognized it from having seen cabinet specimens as one of the oak-leaf rollers, and on diligent search I found it fairly abundant and always on young leaves, which no doubt proved more pliable and easily worked by this ingenious little artificer. It was not easy to see much work done, as the beetle is easily alarmed, and drops from the leaf if approached too closely. I was able in one case, however, to watch the actual process of rolling, and in another some of the preliminary work of cutting. Observations published in an American journal of entomology go to prove that,

though the act is instinctive and involves neither practise nor imitation, it is not absolutely perfect ; leaves have been found cut in more than one place and then abandoned as unsatisfactory.

There is a very interesting account of a British leaf-roller (*Rhynchites betulae*) given by Sharpe in the Cambridge Natural History. The female beetle goes to the margin of the leaf, at the base, but some way out from the stalk, and cuts through the leaf from the margin to the mid-rib somewhat in the shape of an upright letter S ; it then crosses the mid-rib and cuts through the other half of the leaf to the margin, somewhat in the shape of a prostrate letter S. The beetle then returns to the margin, where it begins cutting, and, much as a grocer makes a paper funnel for sugar, rolls the edge over round an ideal axis till it brings it to the mid-rib ; here it holds the funnel in position with the legs of one side, while with the other three it draws the further side of the leaf towards it and wraps it around the part of the funnel already formed. When it finds the material stiff to work with, it bites the surface of the leaf with its mandibles or pushes it into position with its feet, adjusting means to end like a sailor at work in the shrouds furling canvas. It then enters the funnel, bites two or three small pits into the leaf, deposits an egg in each, and, then emerging, completes the funnel by folding over and tucking in the tip of the leaf.

Mr. Sharpe, in comment, points out that the insect has never seen a funnel in its life, and yet manages to make one perfectly the very first time of trying. But the author's perplexity is partly due to his confusing a purely instinctive act with an act of intelligence (vide the Peckham's book on Wasps). How can an insect be a highly-skilled engineer, working with mathematical accuracy and on a scientific plan ? It is an insoluble problem if you try to state your answer in terms of intelligence and individual consciousness. But place it among impulsive acts, involuntary and more or less mechanical, common to all members of the species, and you can give a fairly satisfactory explanation in terms of instinct.

Among insects especially are found instincts whose perfection is simply diabolical, often involving a highly-complex series of acts performed but once in the whole lifetime of the individual, and therefore admitting of neither practise nor imitation. To look upon such acts as the result of conscious intelligence is absurd ; the intellect has no place here, and would be simply a meddler, likely to bungie and make a botch of the artificer's work. On the other hand, a whole-hearted Darwinian like Weismaur has no difficulty in applying his great principle of selection to such an act, and

seeing in it once more beautiful illustration of how all things living in the world, whether *flora* or *fauna*, are adapted to their environment.

As I have begun with one of the weevils which come at the end of the Coleoptera in classification, I will pass to a family not far removed from the weevils, the Blister Beetles (*Meloidæ*), many of which in the mature state occur abundantly on foliage and are very destructive. Four species of the genus *Epicauta* are known in Ontario; some of them occasionally attack the leaves of the potato, but more usually they feed harmlessly on flowers like golden-rod and helianthus or the low herbage by river banks. I have not seen any of this genus, and think it uncommon east of Toronto, or at least in the neighbourhood of Port Hope. One species of an allied genus (*Macrobasis unicolor*), which also attacks the potato, I have found in great abundance about Port Sydney in low grounds, feeding and breeding on the foliage of meadow-rue. The family consists of two tribes, *Cantharidæ* and *Meloidæ*. The former all have power of flight, and are frequently found about foliage or flowers; in the latter the wings are abortive or entirely absent, and the beetle's most daring excursions into the realm of air consists in crawling up a grass-blade or the stem of some herbaceous plant. One or two species of *Meloe* or Oil Beetle are frequently found early in the spring and late in the summer, but the insect does not appear to eat foliage. Both tribes of this family are famous for their possession of a principle known as cantharidine, whence they are called Blister beetles, some of the species being of great medicinal value.

A more remarkable feature about them, which they share with some of their neighbours, the *Mordellidæ*, is the phenomenon of hyper-metamorphosis. They are all parasitic in the larval stage, their hosts being usually bees, occasionally wasps and (in the case of *Epicauta*) locusts. The normal form of the larva is preceded by a very active louse-like insect known as a triungulin (each leg terminating in a triple set of hooks). The larva that succeeds the triungulin is inactive and almost legless; moreover, in some cases the true pupa is preceded by a sort of preliminary pupal form, from which emerges a larva of habit almost as active as the original triungulin, though it does not feed.

The triungulin is a monomaniac, I mean a creature of but one idea, one single goal of ambition, and its six active legs enable it to get there. The loadstone that draws the triungulin like a steel-filing to a magnet is the egg of its host. In the case of *Epicauta vittata*, this is the egg cluster

of a locust, and the present beetle takes the precaution of laying its egg near where the locust has hidden its egg-batches in the ground. Among the Cantharids, whose host is a genus of bee (*Anthophora*), the beetle oviposits near the bee's nest, but in order that the triungulin may reach the egg of the bee, it has to be carried into the nest by a queen bee ; its instinct impels it to seize the first hair within reach. This frequently proves to be the leg of a drone, and in some cases the triungulin manages to transfer itself to the leg of a queen bee during the nuptial flight, and so reaches its goal, the egg cell in the hive. But hundreds of triungulins must perish from seizing a wrong object, and in order to compensate for this, selection has enormously increased the fertility of the female beetle, which lays as many as 2,000 eggs. In the *Meloe* or Oil beetle the instinct is even more imperfect ; the beetle does not lay her eggs near the home of the host, and the triungulin mounts to the top of grass-stems or enters a blossom and waits there for a hair (any hair will do) ; this more often than not proves to be growing on the leg of a fly, or if a bee, the wrong kind, and thousands of the triungulins, instinctively seizing the first hairy object that offers, are carried into space to perish miserably. All that saves the *Meloe* from utter extinction is the stupendous fecundity of the female, the clutch of eggs laid by this Apteryx among insects producing a brood of no fewer than 10,000 triungulin chicks.

Apart from the great Phytophagous group of beetles, easily the best known family of leaf-eaters is the Scarabæids. One section of this family consists of scavengers pure and simple, the larva being nourished in manure or rotting wood and the female laying her eggs in such material. But an important branch of the family is phytophagous, the larvæ feeding on living vegetable matter, usually the roots of grasses and herbaceous plants, and the mature insects often feeding voraciously on leaves of trees or soft vegetable tissue.

In this family of beetles, structurally so different from the Phytophagous Beetles, strictly so called, it is interesting to note how far one group has diverged from another in response to conditions entailed by their chosen food material. Among the *Coprini* you find the larval stage completed in a few weeks, or at most months, while the life of the mature beetle (as in *Scarabæus*) extends over a period of two or three years. Among the *Melolonthini* almost the converse obtains ; the larva takes two, three or even five years to mature, and the beetle after emerging from the ground lives for only a week or two.

In Ontario the most familiar of these phytophagous scarabs are the leaf-chafers, popularly known as June bugs. After three years passed in subterranean obscurity the beetles emerge, often in vast quantities ; they are inactive during the day, and remain hidden in the grass at the foot of trees or on the foliage itself, but at dusk they rouse up from their lairs and fly about among the trees in irregular flight, noisy and blundering ; before midnight their activity on the wing ceases. The life of the individual beetle after emerging from the ground lasts little more than a week or two, and you would naturally expect its chief concern to be the perpetuation of its kind.

But often *Melolonthinus*, like Launcelot Gobbo, is a huge feeder, sometimes entirely stripping fruit trees and ornamental shade trees of their foliage. There are one or two genera in this group containing species a good deal smaller than *Lachnosterna*, the true June bug, which are also very destructive in some parts and seasons. The Rose-chaffer (*Macrodactylus subspinosus*), not content with eating the buds and petals of rose blossoms, frequently attacks the grapevine and the foliage of various fruit trees ; it is also sometimes a pest on young corn ; it does not seem so far to have made its way east of Toronto in any serious numbers.

A closely-allied genus is the *Dichelonychia*, one species of which (*D. elongata*) I have often seen eating the foliage of basswood. Three seasons ago it was very abundant in the woods near Port Hope, and responsible for a good deal of damage done in July to the foliage of forest trees ; it shows a decided preference for basswood, eating its foliage more readily and more rapidly than other leaves, though I have found it on hawthorn and on maple.

Another genus, that of *Hoplia* (*trifasciata*), occurs often on hawthorn leaves, but is almost entirely a pollen-feeder, like *Trichius piger* and *Euphoria inda*. *Hoplia*, which occurs often on choke-cherry, early alder and hawthorn, the males appearing at the beginning of May and the females a fortnight later, disappears at the beginning of June. Another species of *Euphoria*, a beautiful beetle called *E. fulgida*, I suspect of eating forest leaves ; I have picked it up several times under trees in open rocky hardwoods on the north shore of the Rideau.

Among Scarabs that frequent foliage are also two species very destructive in the tribe *Rutelini*, large, handsome beetles—*Pelidnota punctata*, found on grapevines, and *Cotalpa lanigera*, chiefly on pear trees, but occasionally on elm, popular and oak. I have never found this

beetle, but the *Pelidnota* has been taken occasionally in the neighbourhood, usually on the cultivated grapevine, but once or twice on wild vines some miles north of the town; it does not appear to be at all frequent east of Toronto.

I mentioned at the outset of my paper the Buprestids as a family peculiarly fond of basking in the sun. There are two genera of Buprestid that eat leaves, *Agrilus* and *Brachys*. The first of these is a long, narrow beetle, taken occasionally on the leaves of basswood, but more common on the foliage of raspberries. The larva bores in the stem of the raspberry. A curious feature about the *Agrilus* is that in appearance and shape, as well as in some of its movements for escape or to elude observation, it closely resembles the longicorn beetle *Oberea*; moreover, the habits and life-history of the two beetles are almost identical; they both lay their eggs in raspberry stems, where the larva bores and feeds, and they both in maturity resort to the leaves of the plant as a resting place and occasionally for food.

The genus *Brachys* is a short form of beetle, almost as broad as it is long, the species I have most commonly found being *Brachys arosa*; it is not uncommon on basswood and two or three other forest leaves, but I have usually found it feeding on the foliage of a hazel (*Corylus rostrata*), where it is sometimes abundant. It is stated in Sharpe's article on insects in the Cambridge Natural History, that some of the smaller kinds of Buprestid have been discovered to feed on the parenchyma of leaves. I know nothing about the larval habit of *Brachys*, but arguing on analogy from *Agrilus*, I would hazard the guess that the larva is a leaf-miner on hazel or other forest leaves.

In drawing a parallel between *Agrilus* and *Oberea*, I referred to both form and habit. The form of *Brachys*, short and broad and somewhat flat, suggests the form of *Odontota*, a leaf-miner among the *Chrysomelians*; in habit, since the mature beetle of *Agrilus* responds to the same food stimulus as its larva, the eating of hazel and other leaves by the *Brachys* beetle may mean that the larva mines in such leaves. (Vide CAN. ENT., 1887, XIX, 159.)

I have found a great many instances among the Coleoptera where the mature insect seems to be affected in a greater or less degree by the same stimulus as the larva. Perhaps the sight of the larva's food-plant strikes on some happy chord of childish recollection in the mature beetle.

To the student of animal instinct it is no doubt far more wonderful that an insect in its comparatively short life should at different stages respond to two quite distinct food-stimuli. The syrphus fly, *Eristalis tenax*, whose larva feeds in liquid manure, is, at maturity, a honey-sucking haunter of blossoms; in extreme cases, like that of the parasitic oil beetles, as many as three distinct food-stimuli occur in the life of the individual.

But in my ramble through the realm of Coleoptera, it is the opposite phenomenon which has struck me most. I mean the number of beetles that are attracted to the food of their larva. I have noticed this especially among the Cerambycidae. In many of them the smell of fermenting sap (where a tree is newly felled or has been injured by the lopping of branches or the mutilation of bark) seems to act as a direct and powerful stimulus in liberating the instinct of reproduction. This is specially noticeable in the Monohammi. In others again, where perhaps the smell of sap has first drawn the insects to the tree for breeding purposes, the sight of the foliage seems to impel the beetles to eat the leaves. This is particularly the case in some genera that approach most nearly to the Chrysomelians. We have a familiar illustration of it in *Tetraopes*, the Milkweed beetle, whose larva feeds in the stem of the plant, while the beetle resorts in large numbers to the leaves, on which it feeds freely as well as breeding. Less conspicuous examples of the same phenomenon are the *Oberea*, and still more the *Saperda*. I have several times captured *Saperda vestita* feeding on the sheaf of leafy twigs surrounding the basswood stumps, under whose bark the eggs are laid. I have found *Saperda moesta* eating the leaves of the poplar where its larva develops, and on a single willow I once counted over 200 specimens of *Saperda concolor* breeding on the leaves and eating the foliage with evident relish.

These last few paragraphs have brought me right into the great group of Phytophagous beetles, properly so called, whose larvæ, without exception, find support on living vegetable tissue. They comprise three families, the Bruchids, which devour seeds; the Cerambycids, which attack the woody tissue of trees and shrubs, and the Chrysomelids, which feed at all stages on foliage and the more succulent parts of vegetation.

The Bruchids form only a small group, and the genus *Bruchus* is the only one of much importance; besides the Pea and Bean Weevils (so called), the only species I have found at all abundant is a minute insect, *Bruchus discoides*, sometimes plentiful in the blossoms of the white *Convolvulus* or Morning Glory.

The Cerambycids appear to have been in their origin scavengers, rarely attacking sound wood ; but the larvæ of many of them before reaching full growth eat right into solid timber, while others appear to eke out their existence by draining the afflux of sap to the part they have wounded ; yet others again have deserted the forest tree that formed their ancestral home and taken up their abode in the fruit trees of our orchards. The larvæ develop slowly, and must greatly reduce the vitality of the tree they infest. They are exceedingly tenacious of life, and many instances are on record to show that the larval stage is capable of enormous extension.

The imago of *Monohammus* has been known to emerge from chairs and tables years after the manufacture of the furniture. Mr. C. O. Waterhouse, an English Naturalist, heard one of these larvæ at work in a boot-tree (an implement for stretching top boots) which he had in his possession for 14 years ; he then presented the implement to the Natural History Museum at Kensington, where for six or seven years longer the larva continued to saw wood. The entire absence of sap had of course arrested the development of the larva, and it was unable to complete its transformation. Sereno Watson, the American botanist, relates another case (Packard, U. S. Ent. Comm., 1890, p. 689), that seems to prove the life of one longicorn to have lasted 45 years. When you add to this tenacity of life the larval obscurity which makes even detection difficult, it will be seen how serious a pest the longicorns may and often do become.

The Chrysomelians, on the other hand, live openly on foliage, which they devour as beetles no less than as larvæ. The larval stage is short and the insect, as a rule, helpless and easily destroyed. They more than compensate, however, for their exposure to attack by their rapid breeding, many genera producing two broods every season. There are 11 tribes of the family in boreal America, all of them represented in Ontario. But the great bulk of our Chrysomelidæ belong to the four consecutive tribes—*Cryptocephalini*, *Eumolpini*, *Chrysomelini* and *Galerucini*—the last of these is far the greatest, and contains more genera and almost as many species as the other three combined. Together these four tribes contain more than two-thirds of the entire genera and species in the family.

As, geologically, the woody fibred vegetation preceded the leafy and succulent plants, it is probable that the Cerambycidæ attained their greatest development far earlier than the Chrysomelidæ. But the two families are undoubtedly closely akin, and the Donacias may be regarded, both in form and in habit, as in many respects intermediate between some of the less highly-specialized genera of Cerambycids and the Chrysomelids.

NOTES ON TENTHREDINOIDEA, WITH DESCRIPTIONS OF NEW SPECIES.*

BY S. A. ROHWER, WASHINGTON, D. C.

PAPER XIII, MISCELLANEOUS NOTES.

The Common Pear Slug.

After repeated requests for information concerning the synonymy or correct name of the common pear slug, it has been deemed advisable to publish certain remarks on this species. According to Rev. Herr F. W. Konow's classification (a) this species belongs to the genus *Eriocampoides* Konow. Dr. A. D. MacGillivray (b) places *Eriocampoides* Konow as a synonym of *Caliroa* Costa, dividing Konow's genus into *Endelomyia* Ashmead and *Caliroa* Costa. In this the use of names is wrong. Konow's genus, as defined by him, may be divided into two subgenera, as follows : (c)

Clypeus truncate ; pedicellum shorter than the scape ; hind wings of the female usually with only one

discal cell *Caliroa* Costa, syn. *Endelomyia* Ashmead.

Clypeus emarginate ; pedicellum subequal in length with the scape ; hind wings of the female usually with only one

discal cell *Eriocampoides* Konow.

As these characters are hardly of generic importance, the above two groups should be treated as subgenera.

Linnæus (d) describes a sawfly under the name *Tenthredo cerasi* as follows :

"Cerasi. 14. T. antennis septemnodis, corpore nigro, pedibus luteis.

"*Reaum. ins.* 5, t. 12, f. 1-5.

"*Habitat in Cerasi foliis, quæ involvit ut mutetur.*"

*Papers IX, X, XI, XII and the present one may be considered as contributions from the Division of Forest Insects, Bureau of Entomology, U. S. Department of Agriculture. In paper XII, Vol. 42, July, 1910, p. 242, it was stated that a paper on the subgenus *Hoplocampa* would be used as paper XIII. When the paper was completed it was found that it could be published in a series of technical papers of the Bureau of Entomology, and will appear as such.

(a) *Genera Insect.* fas. 29, 1906, p. 74.

(b) *CAN. ENT.*, Vol. 39, Oct., 1909, p. 346 and 347.

(c) The matter of generic synonymy is treated more fully in a paper to be published shortly by the Bureau of Entomology.

(d) *System. Nat.* Ed. 10a I, 1758, p. 557, n. 14.

April, 1911

This description is very incomplete, but by referring to the figures and account given by Réaumur, which figures and describes the adult and larvæ, also the skeletonization of a cherry leaf, there can be but little doubt that this refers to a species of *Caliroa*; the description applying very well to the species commonly given as *limacina* Retzius (e), Degeer (f), who purports to be treating the same species as Réaumur, also figures a species of *Caliroa*.

Tenthredo flavipes Schrank (g) may well be considered to be a synonym of *Tenthredo cerasi* (Linnæus).

Retzius (h) describes his *Tenthredo limacina* as follows :

"313. *T. limacina*, antennis filiformibus, 9-nodiis, nigra, pedibus fuscis, alis nigrescentibus. T. 2, p. 1007, t. 38, f. 16-25. [Referring to Degeer's writings.]

"*T. cerasi*, L. S. N., p. 923."

From the very description it is evident that Retzius is renaming the *Tenthredo cerasi* of Linnæus.

Tenthredo (*Selandria*) *cerasorum* Dahlbom (i) is a new name for the *Hylotoma cerasi* Fallen, and is not a species of *Caliroa*. (j)

Tenthredo (*Allantus*) *adumbrata* Klug (k) is a synonym of *cerasi* Linnæus.

Selandria atra Stephens (l) is considered by Konow to be a synonym of *Caliroa* (*Eriocampoides*) *annulipes* (Klug), and may be, but it is probable that the *Selandria atra* Westwood (m) is not *annulipes* (Klug), but *cerasi* (Linnæus).

The publication of the description of *Tenthredo* (*Blennocampa*) *æthiops* Gimmerthai (n) is not available.

(e) Herr Konow, Gen. Insect. fas. 29, 1906, p. 127, places *cerasi* Linnæus as a variety of *Tenthredopsis litterata* (Fourcory), but this would seem to be in error, as Réaumur's figure can not apply to a species of *Tenthredopsis*.

(f) Mem. hist. Insect. II (I) 1771, p. 1007, n. 23 ; T. 38, F. 16-25.

(g) Enum. Insect. Austr., 1781, p. 340, n. 686.

(h) Gen. and spec. Insect., 1783, p. 73, n. 313.

(i) Conspect. Tenthred. Scandin., 1835, p. II, n. 142.

(j) Rev. Herr Konow places it, apparently correctly, as a synonym of (*Tenthredo*) *Aneugmenus stramineipes* (Klug).

(k) Magaz. Ges. Naturf. Fr. Berlin, VIII, 1814, p. 64, n. 36.

(l) Illus. Brit. Mandib., VII, 1835, p. 52, n. 30.

(m) Gard. Ghron., 1848, p. 524 ; Entom. Annual, 1862, p. 132.

(n) Arbeit. naturf. Ver. Riga. I (I), 1847, p. 52, n. 3.

Tenthredo (Selandria) ethiops Eversmann (o) is described as belonging to a group of species having "a. Area lanceolata petiolata, *Alae posticae cellula discoidali carentes," which does not apply to *Caliroa*.

Monostegia antipopa W. F. Kirby (p) may well be considered as a synonym of *Caliroa (Eriocampoides) cerasi* (Linnæus) Kirby (q), to the contrary notwithstanding. Examination of the type of Kirby's species failed to disclose differences other than the venation of the hind wings, which is not reliable.

Tenthredo cerasi Peck (r) is, as Dr. MacGillivray has pointed out, a synonym of the Linnean species.

The synonymy of this species expressed below will serve to indicate the different names under which the species has been referred to. For a bibliography of the species up to 1894 one may consult Dalla Torre's *Catalogus Hymenopterorum*, Volume one. Since then a number of authors have referred to this species, and the damage done by it in both the palæarctic region and in Australia. Many of these are merely records of occurrence without much value. Some also reproduce the figures given by Mr. C. L. Marlatt (s). To assure themselves of the identity of their insect, entomologists will do well to consult Dr. MacGillivray's table (t) to the species of this group, and Marlatt's figure one.

CALIROA (*Eriocampoides*) CERASI (Linnæus). The common pear slug.

Synonyms :

Tenthredo flavipes Schrank.

" *lamacina* Retzius.

" (*Allantus*) *adumbrata* Klug.

" *cerasi* Peck.

Selandria atra Westwood (apparently).

Monostegia anthipoda W. F. Kirby.

THE NAME OF THE TURNIP SAWFLY.

Rev. Herr F. W. Konow (a) gives as the name of the turnip sawfly *Athalia colibri* Christ, 1791, placing as a synonym *Tenthredo salicis*

(o) Bul. Soc. Mouscou, XX, P. I, 1847, p. 29, n. 1.

(p) Tr. Ent. Soc. Lond., 1881, p. 50, n. 81.

(q) Ent., Vol. 37, 1904, p. 84.

(r) Mass. Agr. Rept., 1799, p. 9.

(s) Circ. 26, second series U. S. D. A. Bur. Ent.

(t) CAN. ENT., Vol. 39, Oct., 1909, p. 347, etc.

(a) Gen. Insect. fas. 29, 1906, p. 93.

Schrank, 1781. In Dalla Torre's *Catalogus Hymenopterorum*, 1894, p. 152, this species is given as *Athalia spinarum* (Fabr.) Leach. As Konow has indicated (Gen. Insect. and other references) *spinarum* Fabricius is a synonym of *colibri* Christ; but *Tenthredo salicis* Schrank, 1781, is not the proper name as might be surmised from Konow's synonymy, because in mentioning *Tenthredo salicis* Schrank (a) cites as the species he is describing *Tenthredo salicis* Linnæus, 1761, which is now *Pteronus salicis* Schrank, therefore, although he did describe a species of *Athalia*, did not establish a valid name in the genus, having only misidentified the Linnean species, *Tenthredo salicis*. The synonymy of this species would be as follows:

ATHALIA COLIBRI (Christ) Konow.

Tenthredo salicis Schrank, 1781 (not Linnæus, 1761).

" *spinarum* Fabricius, 1793.

" *centifoliae* Panzer, 1795.

The subspecies and varieties as well as the biography have been omitted.

EUURA Newman versus CRYPTOCAMPUS Hartig.

The genus *Cryptocampus* Hartig (b) was published in March, while the genus *Euura* Newman (c) was published in January. *Cryptocampus* Hartig must, therefore, fall as a synonym of *Euura* Newman.

ARGE Schrank versus HYLOTOMA Latreille.

Rev. Herr F. W. Konow (d) replaces the generic name *Hylotoma* Latreille by *Arge* Schrank with the following words: "Statt des Gattungsnames *Hylotoma* Latr. muss der oblige ältere Name eintreten." The two names in question were proposed in works dated the same year. *Arge* Schrank, in *Fauna Boica*, Vol. 2, part 2, 1802, p. 209 and pp. 226 to 229; *Hylotoma* Latreille, in *Hist. Nat. Ins.*, Vol. 3, 1802, p. 302. *Arge* was founded on six species arranged in the following order: *Tenthredo ustulata* Linn., *T. enodis* Linn., *T. ciliaris* Linn., *Arge rosincola* Sck., *A. bicolor* Sck., and *A. berberdis* Sck. *Hylotoma* was founded on one species, *T. rosæ* Linn., which is given as an "example."

(a) Enum. Ins. Austr., 1781, p. 338.

(b) Fam. d. Blatt. und Holzwespe, 1837, p. 221.

(c) Ent. Mag., Vol. 4, 1837, p. 259.

(d) Deutsch. ent. zeit., Vol. 30, 1886, p. 73.

There seems to be no positive way of proving which book was published first, but evidence seems to indicate that Schrank's work has priority. The "Vorrde" of Volume 1, part 1, of Schrank's work is dated March 12, 1801, and there seems to be but little doubt that this part appeared in 1801; part two then probably appeared in 1802, as its title page indicates. Volume 2 of Hist. Nat. Crust. and Ins. was noted by Illiger in 1803 (p. 282). This volume was supposed to have been published in 1802. Volume 4 of Latreille's work on page 332 refers to W. Kirby "Apum Angliæ," which is said to have been published in 1802, and the dedication was written May 1, 1802. Considering the slow means of transport, it would seem improbable that Kirby's work could be published in 1802, and be mentioned in a book by Latreille, also published in 1802. Indicating as this does that Latreille's works did not appear in the year their title page is dated, while Schrank's work probably did, we may well assume that Schrank's work has priority.

The International Committee on Zoological Nomenclature has not, as yet, ruled on cases of different books published on the same date containing different names for the same animal, but if the Code of Nomenclature adopted by the American Ornithologists' Union is indicative of the ruling of this committee, *Arge*, which has page precedence over *Hylotoma*, will be used. (b) The first reviser rule as defined by the International Committee does not cover the case either, as it refers only to names published in the same work. If, however, the first reviser rule was to be made to apply to such cases, *Arge* would again have to be used for *Hylotoma*; because, although the SPECIES of *Hylotoma* had been revised by Fabricius, Fallen, Klug, Dahlbom, Hartig, Thomson, Cameron and others before Konow came into the field, Konow is the first reviser of the GENERA, as he is the first to bring the generic name *Arge* in connection with the other genera of the group, and to give characters for their separation.

All this shows the desirability of using *Arge* for *Hylotoma*, as the European master has done. Now the pendulum has swung, it would be folly to try and swing it back. Such oscillation will never bring stability in nomenclature, a thing much needed and desired.

(b) See Canon XVII, p. xlix of the 1908 edition, which says: "Of names published simultaneously in different books, that shall be taken which stands on the anterior page."

FIFTH ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF AMERICA.

The Fifth Annual Meeting of the Entomological Society of America was held at the University of Minnesota, Minneapolis, December 27th and 28th, in the School of Mines Building. The president, Dr. J. B. Smith, presided throughout the session. In the absence of the secretary-treasurer, Professor J. G. Sanders was elected secretary pro tem.

The following papers were read during the session :

E. L. Dickerson.—“Notes on the Tingid *Leptobyrsa explanata* Heid.”

J. B. Smith.—“Notes on *Sanninoidea exitiosa*.”

J. P. Jensen.—“The Structure of Spermatophores in Crickets.”

S. J. Hunter.—“The Biological Survey of the Insect Life of Kansas.”

H. C. and H. H. Severin.—“An Experimental Study of the Death-feigning Habits of *Belostoma (Zaitha) flumineum* and *Nepa apiculata* Uhler.”

C. H. T. Townsend.—“Announcement of Further Results Secured in the Study of *Tachinidae* and Allies.”

T. D. A. Cockerell.—“Some Suggested Rules to Govern Entomological Publications.”

The report of the Committee on Nomenclature was received and ordered printed.

The report of the Executive Committee showed that nineteen new members had been received during the year and four lost through death.

The result of the mail vote ordered by the Society at the Boston meeting was that the annual dues of the Society should be two dollars, this to include a subscription to the Annals of the Entomological Society of America.

The following officers were elected :

President—Professor Herbert Osborn.

First Vice-President—Professor Lawrence Bruner.

Second Vice-President—Professor Alex. D. MacGillivray

Secretary-Treasurer—Professor Alex. D. MacGillivray.

Additional members of the Executive Committee :

Professor J. H. Comstock.

Dr. W. M. Wheeler.

Professor J. B. Smith.

Dr. H. Skinner.

Professor C. J. S. Bethune.

Dr. A. D. Hopkins.

The annual public address was given in Handicraft Hall by Prof. F. L. Washburn : “The Typhoid Fly in the Minnesota Iron Range.”

ALEX. D. MACGILLIVRAY, Secretary-Treasurer.

THE PREPARATORY STAGES OF *PHRAGMATOBIA ASSIMILANS* WALKER, VARIETY *FRANCONIA* SLOSSON.*

BY ARTHUR GIBSON, OTTAWA, ONT.

On May 4, 1909, Mr. Horace Dawson, of Hymers, Ont., forwarded to me some arctian larvæ which he had found crawling on snow. These larvæ, with the exception of two or three, which were parasitized, and four others which died, spun their cocoons and pupated during the journey to Ottawa. Others which Mr. Dawson kept himself were making their cocoons on the above date. The first moth, a male, from the larvæ sent emerged during the morning of May 21, and I was delighted to see that it was the variety *franconia* of *Phragmatobia assimilans*. Before 3 o'clock of the same day another male had emerged, and also a female. Other specimens emerged as follows: one on May 22, one on June 2, one on June 3 and four on June 21. One of the males which emerged on May 21, and the female, which issued the same day, were put in a small wooden box with sides of gauze; this was placed out of doors beneath a large pine tree, and left there for two days, when it was brought into the office and the female transferred to a small wooden pill-box. By May 26 a small batch of eggs was laid, and on May 28 another cluster was deposited. The eggs were laid side by side, not loosely, as is the habit in *Apantesis*, and were firmly attached to the side of the pill-box. The first batch comprised 26 eggs, the second 23. From these, 40 larvæ were obtained, the first specimens hatching on June 2, and the last ones on June 4. The following notes were taken on the egg, larval stages and pupa:

Egg.—0.8 mm. in diameter, 0.7 mm. in height; conoidal, rounded, flattened at base; creamy-white, shining, reticulated.

Stage I.—Length, 2.5 mm. General appearance dark at first, turning greenish after feeding. Head 0.3 mm. wide, black, shining; mouth-parts brownish. Thoracic shield dark brown, shining. Tubercles on body large and conspicuous, with exception of i, which is very small; all shiny, pale brown in colour, and each bearing a long, slender, slightly barbed hair. No markings on the body. Ventral surface and prolegs whitish, the latter darkened in places. Thoracic feet pale brown.

Some of the larvæ passed the first moult on June 8, the others soon afterwards.

*Contributions from the Division of Entomology, Ottawa.

April, 1911

Stage II—Length just after moulting, 5 mm. General colour dark grayish, turning paler towards end of stage. Head 0.5 mm. wide, black, slightly depressed at vertex. Thoracic shield dark brown. A series of conspicuous reddish blotches now occur on the dorsum, in a line with tubercle i, and also others of the same colour below the lateral tubercles, those near tubercle ii, however, being more intense in colour, almost a blood-red. Tubercles black, shiny, each bearing a bunch of spreading bristles of varying lengths, those from tubercles below the spiracles being pale, almost golden, while those from the dorsal and upper lateral tubercles are black. Spiracles black. Prolegs pale, thoracic feet darkened.

A few larvæ moulted the second time on June 11, others on 12th and 13th.

Stage III.—Length at first, 8 mm. Head 0.9 mm. wide, black, shining. Body darker than in Stage II, caused by the reddish blotches on skin being now of a dull purplish colour, the whole skin being more heavily streaked and blotched than before. Under a lens the greenish ground colour of the skin shows up against the dull purple in the centre of the dorsum as a stripe. The bristles from the tubercles below spiracles are of a pale rusty tinge. Otherwise the larvæ are the same as in last stage.

Larvæ moulted for the third time on June 16, 17 and 18.

Stage IV.—Head 1.2 mm. wide, black, shiny, as in previous stages. The larvæ now differ in the blotches on the skin being darker, some specimens having a pale dorsal stripe, and the bristles from all the tubercles being of a pale rusty colour. Length at end of stage, when at rest, 15 mm.

Larvæ moulted again on June 21, 22 and 23.

Stage V.—Length just after moulting and at rest, 15 mm. Head 2.0 to 2.2 mm. wide, rounded, somewhat quadrate, depressed at vertex; black, shiny, brownish patch on cheek above ocelli. The skin is of a uniform dull purplish colour, paler around the tubercles, which are dull blackish. Tubercles, with exception of ventral series, large; i slightly smaller than ii and iii. Bristles from tubercles stout, conspicuously barbed, of a dull rusty or mouse-colour, those below the spiracles being brighter. The pale dorsal stripe present in some specimens in Stage IV is only visible now just after moulting. Spiracles cream-coloured, ringed with black. Thoracic feet black, shining; prolegs, upper half concolorous with venter, lower half pale.

Soon after the larvæ reached this stage they stopped feeding, and within a week all had died. No disease could be detected among them. They simply refused all food offered them, and acted as if they wanted to hibernate. The heads of the four larvæ mentioned above, which died during their journey to Ottawa, measure 2.2 mm., 2.2 mm., 2.3 mm. and 2.3 mm., respectively, the same width as those of Stage V. Mr. Dawson informs me that these larvæ winter full fed; he has watched them closely, and has never seen them eat anything in spring. He has on several occasions found them crawling on snow in March and April, looking for a place to pupate.

Cocoon.—The cocoons of the larvæ first received were spun among some leaves and moss in the box in which they were sent. The cocoon is thin, but not so slight as in *Apantesis*, the pupa being readily seen within. It is simply a light network of whitish silk, to which has been attached many of the hairs from the larva.

Pupa.—Length, 14–15.5 mm.; width at widest part 5.5 mm.; black, shining; folds of abdomen bright reddish-yellow; abdomen bears, sparsely, short thick hairs. Spiracles black. Cremaster round, reddish, shiny, terminating in a bunch of about eight straight, stout, reddish-brown, capitate bristles of varying lengths.

Food-plant.—Mr. Dawson tells me that he thinks the larvæ feed on a species of Lungwort, *Mertensia*. Those which I obtained from eggs were fed on dandelion and plantain.

Parasites.—Two or three of the mature larvæ received had been attacked by a Tachinid. Within a day or two after their arrival at Ottawa the puparia emerged, and later three flies, one of which has been identified by Mr. W. D. Coquillett as *Exorista chelonie* Rond.

Mr. H. H. Lyman, of Montreal, also received some larvæ from Mr. Dawson, and he has kindly sent me the following notes, which I am glad to include here:

“Larvæ of *Phragmatobia assimilians* Walk., var. *franconia* Slosson, received from Mr. Horace Dawson, Hymers, Ont., Nov. 20, 1909.

“Of the usual ‘woolly-bear’ type (and in two stages), head somewhat quadrate, rounded at corners, not bilobed, smooth and shining, dark brown or blackish, with a few brown hairs. Body dark sooty-brown, somewhat foxy towards the ventral surface. Feet blackish, prolegs or claspers light brown. No bands discernible on dorsum.

“Two or three were in a later stage, having apparently moulted ahead of the others. These showed a strongly-marked dorsal band of dull orange. The hairs were of varying lengths, not of the close-cropped form of the previous stage, and more radiating from the warts in appearance. The hairs on dorsal surface were blacker than in previous stage, those towards venter more foxy. Feet and claspers light brown.”

Towards the end of May, 1910, Mr. Lyman wrote saying that he had succeeded in carrying some of the larvæ over the winter, from which he obtained five of the moths. When the larvæ came out of hibernation, Mr. Lyman offered them everything he could think of in the way of fodder, but this they refused, and spun up very soon.

All of the specimens of this moth which I have seen (about 25, including 10 which I reared) are similar in appearance, excepting that the females are darker and smaller, 30-32 mm. in expanse (the males being 33-38 mm. in expanse). The figure accompanying Mrs. Slosson's original description* is very good, but the band on the secondaries in all of the specimens before me (11 males and 3 females) is marginal, not submarginal as in the description, with the exception of one male, in which the band is nearly wholly marginal. This band, too, is much wider in our specimens than in the figure above referred to.

I have never seen typical *Phragmatobia assimilians* from Canada, all of the specimens examined by me being the form known as the variety *francoia*.

Distribution in Canada.—In addition to the specimens reared from larvæ received from Hymers, Ont., and adults taken there by Mr. Dawson, the writer has records of specimens collected at Sudbury, Ont. (J. D. Evans); Ottawa, June 3 (A. Gibson); Ottawa, May 24 (A. Nicholls); Montmorency Falls, Qué., June 14 (A. R. M. Boulton); Lake Beauport, Que., June 23 (A. R. M. Boulton); Meach Lake, Que., May 16, 17 (C. H. Young).

FOUR NEW SPECIES OF ASILIDÆ.

BY NATHAN BANKS, EAST FALLS CHURCH, VIRGINIA.

Ommatius maculatus, n. sp.

Face with white pubescence and long white hair below, dense white hair behind mouth-parts; antennæ all blackish; thorax black, shining, a grayish-white stripe each side, wider at ends, a cross-mark from middle of each stipe to the margin, and the lower lateral margins grayish-white, so

*Entomological News, March, 1891.

that the thorax above shows a long shining black median stripe and two shining black spots on each side ; scutellum gray-white ; pleura black, gray pollinose ; coxæ black, front ones white pollinose, and front and middle coxæ with white hair at tips ; legs reddish-yellow, front and middle femora mostly black, but pale at base, hind femora black on apical half, tibiæ black at tips, and the tarsi mostly black above, femora shining, all with white hairs and bristles, but black bristles on tarsi and tips of tibiæ, hind femora with short, white, spine-like bristles beneath, all bristles on hind tibiæ very short, but little longer than the width of the joint. Abdomen dull blackish, with short, sparse white hair, tips of segment gray ; hypopygium reddish. The large bristles on sides of thorax are yellowish ; the wings hyaline ; venation black, the costa and radius near the middle a trifle heavier and deep black, but not swollen.

Length, 10 mm.

From Bill Williams' Fork, Arizona, August (Snow).

Ommatius pretiosus, n. sp.

Face white pollinose, with long white hair below and a few longer black ones, white hair behind mouth-parts ; second joint of antennæ reddish, rest blackish ; thorax dull blackish, a large whitish pollinose spot each side in front, and one behind over the base of wing, and narrowly connected to the anterior spot ; behind whitish pollinose, also over the scutellum and on each side metathorax ; pleura grayish pollinose ; legs yellowish, with long white hair and some black bristles, a black spot each side at tips of femora, and the tips of tibiæ (especially the hind pair) darker, hind trochanters black, and in male the hind femora have a broad black band nearly covering the entire joint, in female only a long black streak above. Abdomen reddish-yellow, base black, and the apical segments infuscated, in female the base is only black-marked above. Wings grayish fumose, scarcely darker on tip, venation black, margin not swollen. The large bristles each side on thorax are black. The hind femora have no spine-like bristles beneath in the male, but in the female there are stiff black bristles beneath on basal half of hind femora ; the hind tibiæ has one very long bristle above near base and several beyond the middle, one of these also very long ; there are three pairs of long bristles beneath the metatarsi.

Length, 13 mm.

From Palmerlee, Arizona, July (Biederman).

Mallophora fulva, n. sp.

Closely related to *M. orcina*, but distinguished as follows ; No black hair on sides of face, the scutellum and abdomen with fulvous (instead of pale yellowish) hair, and no white hair (all black) on the last joint of the hind tarsi ; the bristles in front of the halteres are pale yellowish (black in *M. orcina*), and there are a few yellowish hairs at base of the wings. The facial tubercle (seen from the side) slopes off more gradually above than in *M. orcina*.

From Palmerlee, Arizona, Sept. (Biederman).

Laphria dispar, n. sp.

Face with dull tawny pubescence, long black hair below with a few yellow ones, and black hairs around base of antennæ, behind mouth-parts and cheeks white hair, while that on occiput and vertex is black ; thorax black, with black hair, a denser tuft on the humeri, and long black bristles on the sides ; long erect hair on the scutellum ; some short tawny hairs at tip of the mesothorax ; the row in front of halteres mostly white, but the upper ones are black ; pleura black. Legs black, anterior coxæ densely long white-haired, also some on the middle coxæ, front and middle femora, and tibiæ with long white hair, the middle tibiæ with two outer rows of long black bristles, tarsi with black bristles, hind femora and tibiæ with pale hair on basal part, rest blackish,

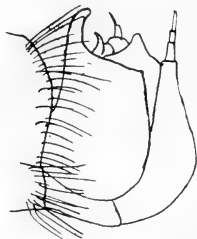


FIG. 5.—*Laphria dispar*, male genitalia.

about four or five curved bristles on outer side of hind tibiæ, each about twice as long as the width of the joint. Abdomen black, with fulvous hair on apical parts of segments, denser at the outer angles, and more on apical segments than on basal ones, apicals frequently covered with fulvous hair ; hypopygium black ; wings hyaline, tinged with darker, especially on the apical half ; venation blackish.

A female has the abdomen more densely fulvous-haired, and the dorsum of thorax with fulvous hair.

Length, 13 to 15 mm.

From Ithaca, N. Y., July ; cotypes from Hecton Mills, Penna., May and June (coll. Walton).

This species has been mixed with *L. sericea*, but the genitalia of the male are very different ; *L. sericea* has more yellowish hair on the face, etc. It differs from *L. ætæus* in absence of tawny hair on chest, in black abdomen, absence of white fringe at base of abdomen, etc.

SOME NEW BEES FROM FLOWERS OF CACTACEÆ.

BY T. D. A. COCKERELL, UNIVERSITY OF COLORADO.

Melissodes opuntiella, n. sp.

♂.—Length about 9 mm.; black, with white hair, that on head and thorax all white, without any ochraceous or fuscous; head broad; clypeus pale yellow, with the usual spots, and the lower margin rather broadly piceous or reddish; mandibles with a large yellow spot; labrum entirely black, with white hair; scape short, black; flagellum very broadly bright orange-fulvous beneath, unusually short for a *Melissodes*, reaching only to about middle of scutellum; mesothorax and scutellum shining, with scattered small but distinct punctures; tegulæ testaceous, with white hair; wings clear, nervures dusky ferruginous; legs black, with dull ferruginous tarsi; hair of legs white, ferruginous on inner side of basitarsi; abdomen finely punctured, the hind margins of the segments broadly hyaline, and with dull white hair-bands; last two segments with short but evident lateral teeth. Not unlike the Mexican *M. otomita* Cresson, but with the face broader, the antennæ shorter (especially the apical joints), and the mesothorax and scutellum more finely and sparsely punctured.

♀.—Length about 10 mm.; clypeus black, closely punctured; eyes green; flagellum short, bright ferruginous beneath beyond the second joint; hair of head and thorax white, without dark, as in the male; first abdominal segment with a patch of white hair at each posterior corner, second with a dense basal hair-band and a broader apical one, both straight and uniform; third and fourth also with broad white apical hair-bands, third with grayish-white tomentum basally; fifth and sixth with the hair entirely dark chocolate; scopa of hind legs loose, plumose, adapted for carrying the large pollen of the *Opuntia*; hair on inner side of hind basitarsi ferruginous.

Hab.—Brownsville, Texas, at flowers of *Opuntia lindheimeri*, both sexes, March 23, 1908 (*Jones and Pratt*); Hondo, Texas, at flowers of *Opuntia*, male, April 30, 1908 (*J. D. Mitchell*); Cotulla, Texas, at *Opuntia*, female, May 5, 1905 (*J. C. Crawford*). The type is a male from Brownsville.

In my tables in Trans. Amer. Ent. Soc., 1906, the male runs to *M. snowi*, which has the flagellum more than twice as long. The female runs nearest to *M. tepaneca*, a much larger species, with fulvous hair on thorax. It really much resembles the female of *M. sphaeralceæ* Ckll., though the latter has dark hair on the thorax above.

Ashmeadiella echinocerei, n. sp.

♀.—Length about $5\frac{1}{2}$ mm.; black, with white hair, yellowish on inner side of tarsi; legs black; tegulae shining piceous. Similar to *H. cactorum* Ckll., but distinguished by its narrow face (facial quadrangle much longer than broad), densely punctured mesothorax and strongly punctured abdomen. The eyes are broader in proportion to their length. As it is rather difficult to appreciate these characters without specimens of *cactorum* to compare, I give measurements:

Length to breadth of facial quadrangle as 85 to 72.

Length to breadth of eye as 85 to 42.

Hab.—Flagstaff, Arizona, at flowers of *Echinocereus*, June 12, 1909 (F. C. Pratt).

Diadasia piercei, n. sp.

Like *D. afflicta* (Cresson), but a little larger; the legs dark ferruginous, and the area of metathorax dullish, microscopically sculptured, not smooth and brilliantly shining as in *afflicta*. Female with abdomen very broad (considerably broader than in *afflicta*), with the sooty-brown scopa of hind legs very long and loose. Tegulae in both sexes rich ferruginous; male with the hair on disc of second abdominal segment not wholly pale. The end of the male abdomen is formed as in *D. afflicta*, not as in *D. bituberculata*. *D. australis opuntiae* often has the scopa of hind legs as dark as in *piercei*, but then it has the hair at the apex of the abdomen tawny-fulvous, not chocolate as in *piercei*. The second submarginal cell in *piercei* is narrow and parallel-sided.

Hab.—Corpus Christi, Texas, at flowers of *Opuntia*, March 18, 1908, one male = type (*W. D. Pierce*); Beeville, Texas, at *Opuntia*, April 30, 1896, 4 ♂'s, 1 ♀ (*Marlatt*).

A species of the Lower Austral Zone.

SMERINTHUS CERISYI KIRBY.

Mr. Wolley Dod's interesting note in the March number has caused me to look up the name of this species. In Kirby's "Fauna Boreali-Americana: Insecta," p. 301, there is a description given of his species which he names "*Smerinthus cerisyi*, Cerisy's *Smerinthus*." Unfortunately, in Smith's and Dyar's lists the name is incorrectly given as "*cerysii*." The species is evidently named after a Mr. Cerisy, who probably was one of Sir John Robertson's party that collected the insects described by Mr. Kirby. It is to be hoped that the name will be correctly given in any future lists that are published.—[C. J. S. BETHUNE.]

AN EGG-PARASITE OF THE CODLING MOTH BELONGING
TO THE FAMILY MYMARIDÆ.

BY A. A. GIRAULT, URBANA, ILL.

The following Mymarid, described years ago, is a parasite of the eggs of the codling moth in Georgia. The record is without a sponsor, as explained beyond, but otherwise I see no reason for not accepting it. Originally the species was described as a parasite of *Lepidosaphes ulmi* Linnæus. I add the following descriptive notes, so that it may be the more easily recognized :

Anaphes gracilis Howard.

Female.—Length, 0.65 mm. Moderately small in size for the genus ; visible to the naked eye.

General colour black, suffused with some yellowish ; base of abdomen contrasting, yellowish ; coxæ, trochanters, all tarsal joints, cephalic tibiæ, both ends of cephalic femora pallid lemon-yellow ; the antennæ, venation, cephalic femora, femora and tibiæ of other legs about neutral or dusky-grayish ; antennal pedicel somewhat lighter and more yellowish. Eyes dark. Wings subhyaline, slightly fumated proximad and along the distal half of the blade.

Body moderately slender, the abdomen as long as the head and thorax combined, conic-ovate, pointed distad, the ovipositor distinctly exerted, but not very much so, the exerted portion not as long, for instance, as the proximal tarsal joint of the caudal legs.

Fore wings usual in shape to the genus, moderate in width, widest just before the apex, the latter dome-shaped, the marginal fringes long, the longest disto-caudad, slightly longer than the greatest width of the blade and distinctly longer than the longest cilia of the posterior wing, but not very much longer. Discal ciliation of the fore wing rather sparse, absent in the proximal two-thirds of the wing and consisting of about seven or eight short lines in the distal part of the blade. Posterior wings with a single longitudinal line of discal cilia, the lines usually along each edge absent *apparently*.

Legs normal, the proximal tarsal joint longer than the other three, but not especially long ; tibial spurs single.

Antennæ 9-jointed, not normal ; scape as long as the pedicel and first three funicle joints combined or longer, curved, as long as the club. Pedicel obconic, stout, as long, or nearly, as the next three joints taken together. Funicle with the joints gradually widening distad, the proximal

joints subquadrate, small, the first funicle joint smallest, joint six largest, four times or more larger than the first ; all funicle joints short, the distal joint alone longer than wide ; funicles two and three subequal, four and five subequal, the latter twice the size of the former, each taken separately, six over twice longer than four or five. Club long, acuminate-ovate, as long as the whole funicle, or very nearly, subequal to the scape ; obtusely pointed.

From two specimens, $\frac{2}{3}$ -inch objective, 1-inch optic (Bausch and Lomb.)

Male.—Unknown.

A species unique for this group because of its antennal structure. (See the figure in its original description.) Black, with a yellowish band about the base of the abdomen.

Described from a single female specimen found in the collections of the United States National Museum, Washington, D.C., labelled "Ex ovo Codling Moth, Tallapoosa, Ga." Remounted in balsam from a tag.

Also another specimen captured on the window of an old pig-shed on a farm at Centralia, Illinois, August 25, 1910 (A. A. Girault). The species must be widely distributed in the United States.

Habitat : United States—Tallapoosa, Georgia ; Centralia, Illinois ; Washington, D. C.

There is a specimen in the U. S. National Museum collection and one in the collections of the Illinois State Laboratory of Natural History, Urbana, Illinois. (Accession No. 42,221.)

MIASTOR LARVÆ.

These remarkably interesting larvæ, reproduced by *pedogenesis*, are available for laboratory work to a marked degree and must be widely distributed as well as allied forms. Very little is known concerning American species, largely because their habitat is one rarely explored by entomologists. They breed mostly in decaying vegetable matter. We have been very successful in finding them under partially decayed chestnut bark of stumps, fence rails and sleepers which have been cut one or two years earlier. European species have been observed under the bark of a variety of trees and even in sugar-beet residue. These Dipterous maggots with diverging antennæ have a flattened, triangular head, quite different from the strongly-convex, usually fuscous head of the *Sciara* larvæ occurring in a similar environment. They have a length of from $1/20$ to $1/8$ of

an inch, and may be found in colonies containing a few large, white larvæ with numerous smaller, yellowish individuals, though the latter appear more common at the present time. Early spring, with its abundance of moist bark, appears to be the most favorable season for finding the larvæ. The writer would welcome the co-operation of entomologists and others in searching for these forms in different parts of the country. He will be pleased to determine specimens found under various conditions, make rearings therefrom if possible, and thus add to our knowledge of the sub-family Heteropezinæ, a group which should be fairly abundant in North America, and one deserving careful study.—[E. P. FELT, Albany, N.Y.]

GNORIMOSCHEMA GALLÆDIPLOPAPPI FYLES AND
-*GNORIMOSCHEMA GALLÆASTERELLA* KELLICOTT.

BY REV. THOMAS W. FYLES, HULL, P. Q.

In the report of the Entomological Society of Ontario for the year 1890, on page 18, and in a paper entitled "A Day in the Woods," I described a Gelechian which produced galls on *Diplopappus umbellatus* (Torrey and Gray); and I said of the species: "These moths differ considerably from those figured and described by Mr. Kellicott in Vol. X, CAN. ENT., p. 201, and from those described by Mr. Riley in the First Missouri Report, p. 172. I would suggest for them the name *Gelechia gallædiplopappi*."

After 20 years, through the favour of Mr. A. Cosens, of Toronto, I have the pleasure and satisfaction of beholding, *for the first time*, a specimen of Kellicott's moth—of the species certified to be such by Mr. Busck, of Washington.

I find that Kellicott's description of his moth is very accurate, and that the drawing he gives conveys a fair idea of it.

I now re-assert, with all confidence, "These moths (those of *G. gallædiplopappi*) differ considerably from those figured and described by Mr. Kellicott in Vol. X, CAN. ENT., p. 201," etc. And I maintain that the name I suggested for the species I discovered is, in all fairness, entitled to stand, and should not be relegated to a synonymy.

I am not alone in this opinion. On December 24th, 1907, Mr. W. D. Kearfott wrote to me: "Your package with the two moths, also letter and drawings, were safely received Saturday. There is no question that your species is most distinctly different from Kellicott's."

April, 1911

On March 11th, 1909, our late friend, Dr. Brodie, wrote to me: "I have always been under the impression that your described species was distinct from the many lepidopterous gall-producers. And I was surprised to see that Dyar* gives it as a synonym. In this particular I agree with Kearfott and yourself."

For those who have not looked into the matter, it may be well for me to particularize some of the points of difference in the appearance and habits of the two species under consideration.

DIFFERENCES IN APPEARANCE.—In *G. gallectasterella* the prevailing tone is *white*—white thorax; white fore wings, having "a brown patch occupying the costal half of the middle third" of the wing. Fore wings and their fringes much spotted.

In *G. gallediplopappi* the prevailing hue is *deep Indian red*—thorax red; fore wing red, with a pale divided fascia near the hind margin; unspotted on wing and cilia.

IN FOOD-PLANTS.—

Dr. Brodie pointed out that the gall figured by Kellicott is not one on *Aster corymbosus*, but one on *Solidago latifolia* (CAN. ENT., Vol. XLI, p. 75).

Mr. A. Cosens writes: "The moth *G. asterella* Kell.-produces galls which are locally abundant on *S. latifolia* L., but are found very rarely on *S. caesia*, var. *axillaris* Gray" (CAN. ENT., Vol. XLII, p. 372).



FIG. 6. *Gnorimoschema gallediplopappi* Fyles.
A.—Gall on *Diplopappus umbellatus* (x $\frac{1}{2}$).
B.—Gall opened to show chrysalis on its mattress.
C.—Larva greatly enlarged.

Mr. August Busck writes, the species "would seem to infest both *Aster* and *Solidago*" (CAN. ENT., Vol. XLIII, p. 6).

On the other hand, *G. gallediplopappi* affects that tall and sturdy plant, *Diplopappus umbellatus* Torrey and Gray. I found it every season during my stay at Levis on this plant, and *never on any other*. For 27 years I searched the Golden-rods around Quebec, hoping to find Riley's *G. gallæsolidaginis*; but the only lepidopterous gall I found upon them was that of *Eucosma scudderiana* Clemens. Neither Riley's moth nor Kellicott's appeared in the district.

IN HABITS OF THE LARVÆ.—From Kellicott's account it appears that *G. gallæasterella* forms its galls "a few inches above the ground, the terminal bud developing very little after the larva begins operations."

The larva fills the way of exit for the moth "with a closely-fitting plug of silk." * * * "It then lines the interior with silk and soon changes to a chrysalis" (CAN. ENT., Vol. X, p. 204).

G. gallediplopappi forms its gall a foot to two feet above the ground, and the growth above it is unaffected.

The larva, when full-fed, spins a slight web above its droppings and directly across the gall, and on this it changes to a chrysalis.

I have opened dozens of the galls, and never found one lined with silk, nor one with the way of exit closed with a plug.

The moths that came from these galls were always true to the type.

In the Annual Report of the Ent. Soc. of Ont. for 1903, page 71, will be found an account and illustrations of two dire foes of *G. gallediplopappi*, viz.: *Bracon furtivus* Fyles and *Trychosis tunicula-rubra* Fyles. Both of these insects were declared to be new and good species by Dr. Ashmead, of Washington.

DESCRIPTION OF A NEW SPECIES OF ORTHOPTERA FROM TEXAS.

BY A. N. CAUDELL, WASHINGTON, D. C.

Stipator mitchelli, n. sp.—♂ (♀ unknown). Allied to *S. haldemanii* and *grandis*, but more heavily built than either of those species. The shape of the cerci of the male is as in *haldemanii*.

Head moderate, no broader than the anterior portion of the pronotum, into which it is deeply set; fastigium of the vertex about one-third as broad as the interocular space; front broadly rounded; eyes medium in size and prominence, a little longer than broad; antennæ long and slender,

much longer than the body. Pronotum large and posteriorly considerably produced over the base of the abdomen, lateral lobes well developed, but not so deep as long, nearly vertical, the posterior margin distinctly sinuous; lateral and median carinae wholly absent except posteriorly, where the median carina is very indistinctly present; anterior margin truncate, posterior margin rounded. Prosternal spines moderate. Organs of flight wholly concealed. Legs long and stout; anterior tibiae armed above on the outer margin with three spines, except on the right leg, where there are four, the inner margin armed with two spines;* posterior femora more than twice as long as the pronotum, and much swollen on the basal two-thirds, armed beneath along the middle of the inner carina



FIG. 7.—*Stipator mitchelli*, cercus of male.

with several small black teeth. Plantulae of the posterior tarsi short, scarcely half as long as the basal segment of the tarsus. Abdomen large and plump; cerci (fig. 7) about three times as long as broad, very slightly curved inwardly, the shaft nearly cylindrical, apically somewhat flattened, and near the tip with a large triangular tooth, the tooth larger and longer than the apical portion of the cercus and of similar shape, giving the general appearance of the cercus being forked, as shown by the accompanying figure. Last abdominal segment notched, the angles no

longer than broad.

General colour green, with pronotum dorsally marked with fuscous posteriorly; the lateral lobes are narrowly bordered with black posteriorly.

Measurements.—Length of pronotum, 12 mm.; posterior femora, 26 mm.; cerci, 2 mm.

Type.—(Cat. U. S. Nat. Mus., No. 13444); Hondo, Texas, March 30, 1908, eating petals of *Opuntia* flowers. (J. D. Mitchell, collector.)

BOOK NOTICES.

DIPTERA DANICA.—Genera and species of flies hitherto found in Denmark. Part III, Empididae. By William Lundbeck; 335 pp., 141 figs. (Copenhagen, G. E. C. Gad; London, Wm. Wesley & Son.) Nov., 1910; \$3.25.

Although among the 164 species of Empididae described in the present volume there are not many which are also found in North America, no student of this Order can afford to be without this valuable

*Probably variable, as in *haldemanni*.

work on the Diptera of Denmark. The first part, which treated of the Stratiomyidæ, Xylophagidæ, Cœnomyiidæ, Tabanidæ, Leptididæ and Acroceridæ, appeared in 1907; the second part dealt with the families Asilidæ, Bombylidæ, Thereoidæ and Scenopinidæ, appeared in the following year, and the present volume forms the third part. The work is being published in both the Danish and English languages. The method of treatment of each species is similar to that adopted by Schiner in the "Fauna Austriaca," though in many cases it is fuller, especially where bionomic notes are available. The illustrations of anatomical features of value in the determination of the species, and in many cases of the larvæ, greatly increase the value of the monograph. The author follows Brauer's classification, as given in the "Katalog der paläarktischen Dipteren von Becker, Bezzi, Kertész und Stein."

The family of Empididæ is a large one; about 440 species are recorded from North America and about 675 species from the palæarctic region; 11 species are recorded as common to both regions. These dark, gray or yellowish flies of a medium to a very small size are generally characterized by their somewhat small, more or less globular head and slender bodies. Many species, especially belonging to the genera *Empis* and *Rhamphomyia*, are seen dancing in swarms over water and in other places. The phenomena connected with these dances, which are of an amorous nature, are of great interest. Copulation takes place in the air, and in many of the species one may see the males capture a small insect, which, instead of devouring, they carry to the females, and copulation takes place while the female is engaged in eating this love offering. The physiological bearing of these phenomena is not known, but it is certainly worthy of investigation, as in the case of many other insects, such as certain mosquitoes, Hemiptera and Orthoptera, where feeding and reproduction bear a close relationship. As in the case of the adults, the larvæ are carnivorous and live in the earth, below leaves, in decaying wood and similar damp and wet situations. Little is known, however, concerning the life-histories of the Empids, but, as a group, they present problems of great interest to the entomologist.—C. GORDON HEWITT.

CONTRIBUTIONS TOWARD A MONOGRAPH OF THE BARK-WEEVILS OF THE GENUS *PISSODES*. By A. D. Hopkins. (Technical Series, No. 20, Part I, Bureau of Entomology, U. S. Dept. Agriculture.)

This is the first part of a bulletin to be entitled "Technical Papers on Miscellaneous Forest Insects," and is modelled on much the same plan

as the author's admirable Monograph of the genus *Dendroctonus*, which appeared in 1909.

The more general part of the paper contains a valuable account of the taxonomy of the genus, including a full description of the external anatomy of the adults, certain features of the internal anatomy and the characters of the earlier stages. It also contains a brief account of the general habits, life-history and distribution of the genus. Following this is a detailed account of the North American species, which includes, in addition to a key to the species, synopsis of adult, pupal, larval, and primary and secondary sexual characters, tables of distribution, host trees, etc. Thirty species are recognized, of which twenty-three are described as new. These are fully illustrated by twenty-two plates and nine text figures.

As but little has been hitherto known of this important group of enemies of coniferous trees, Dr. Hopkins' masterly work will be eagerly welcomed by all students of forest entomology.

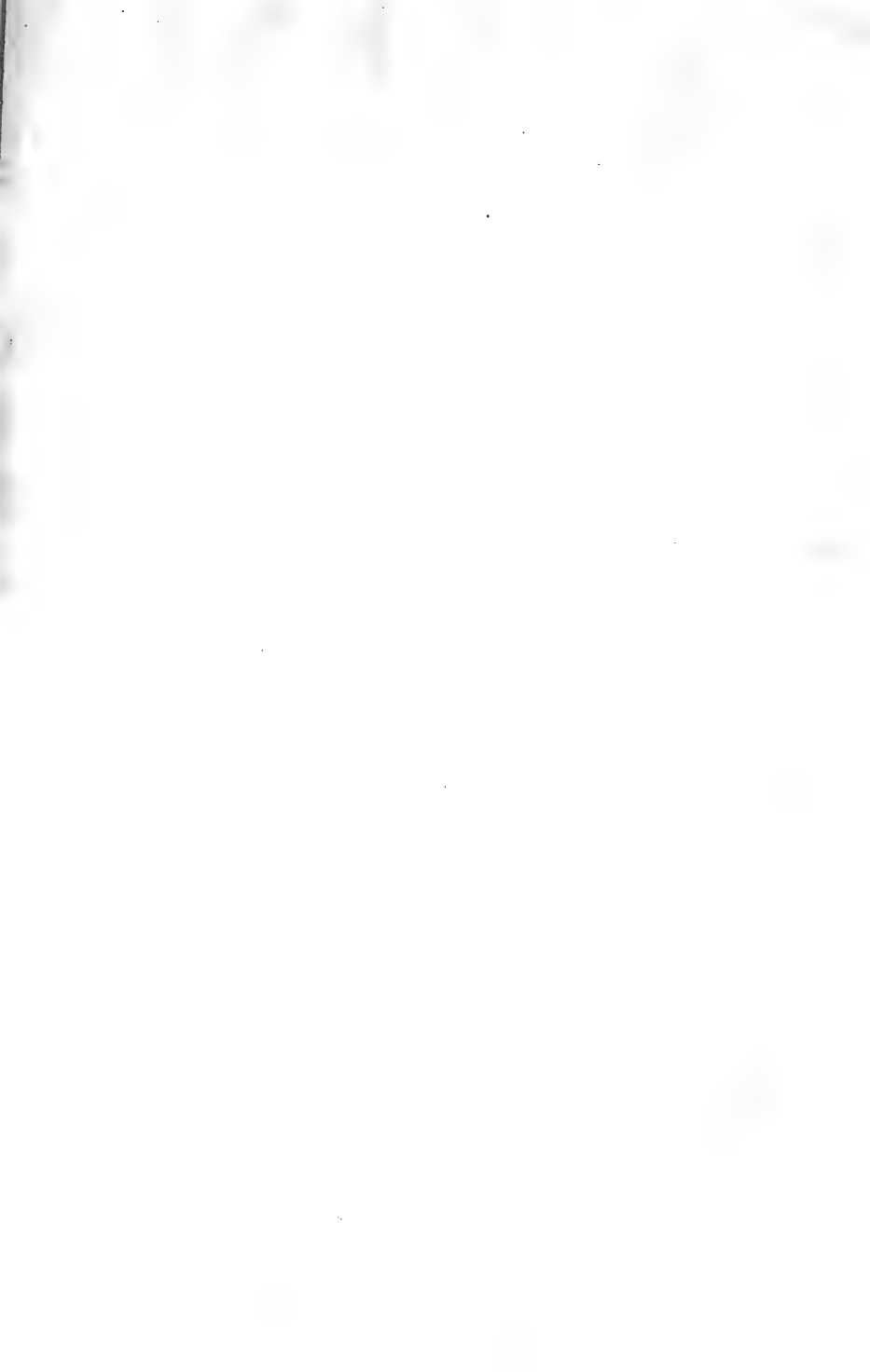
DR. WILLIAM SAUNDERS, LL.D., C.M.G.

The older readers of *THE CANADIAN ENTOMOLOGIST* will receive with deep regret the announcement that Dr. Saunders has found it necessary to retire from the position of Director of the Experimental Farms of the Dominion, which he has held for the last five-and-twenty years. Owing to advanced age and the disabilities consequent upon it, Dr. Saunders has resigned, to take effect on the 31st of March. He intends to make a holiday tour in Europe, leaving at the beginning of May. This will be the first real holiday that he has taken since he entered upon his duties at Ottawa in 1886.

For thirteen years Dr. Saunders was editor of this magazine, and is therefore widely known amongst entomologists, as well as by his published works on the subject. He has the satisfaction of knowing that he has built up a chain of experimental farms reaching from the Atlantic to the Pacific, and that the whole organization is so complete and in such excellent order that it will not require anything like the same labour and difficulty in the case of his successor. There are very few men anywhere who could have undertaken and so thoroughly carried out such a work, as the whole organization had to be originated and brought into working order by his efforts and constant supervision.

All his friends throughout Canada and the United States will join in hearty congratulations to Dr. Saunders on the completion of his immense task and in expressing the hope that he may live many years to enjoy the rest and recreation which he has so thoroughly earned.—[C. J. S. B.]

Mailed April 8th, 1911.





FIGS. I, II, III and IV.



FIG. V.

MITES INFESTING HORN-FLY.

The Canadian Entomologist.

VOL. XLIII.

LONDON, MAY, 1911.

No. 5

OBSERVATIONS ON MITES INFESTING THE HORN FLY, *HÆMATOBIA SERRATA* ROB. DESV.

BY DR. SEYMOUR HADWEN, OTTAWA, ONT.

The mites were first observed on July 3rd at Duncans, British Columbia. My attention was drawn to them by seeing several specimens of *Hæmatobia serrata* Rob. Desv., which appeared to have been powdered with brick-dust; on looking more closely I found that they were heavily infested with mites. Out of 118 flies captured I found 94 infested with mites, but as mites were seen travelling from one dead fly to another it was difficult to arrive at a positive determination. This estimate was made with the aid of a hand lens; the number found on each fly varied; some had 4, 5, others were covered.

Later I found the mites in other parts of British Columbia. This occurrence, coupled with the fact that *H. serrata* does not seem to have been such a serious pest during the past summer (1910), as it usually is, suggests to my mind that the mite may prove to be detrimental to the fly.

On one farm I visited frequently during the summer, where the owner had been spraying his cattle said that the spraying had diminished the number of flies. He was asked to stop spraying for a time, and no apparent increase was noted.

On communicating with Mr. N. Criddle, of Treesbank, Manitoba, I learned that *H. serrata* in that locality did not appear to be infested with mites.

Some living infested flies were shipped to Mr. Criddle, but arrived dried up and dead. No further attempt was made to try and infect clean flies in a new locality.

The introduction of *H. serrata* into British Columbia dates back some years. I find a record of a specimen taken by Miss Ricardo at Vernon in July, 1902.

According to Dr. Rutherford, the fly was first recorded as a serious pest in Ontario about twenty years ago, from whence it spread to other parts of the Dominion.

In reading Austen's British Blood-sucking Flies, 1906, I note the following: "In the British Isles this (*L. irritans* = *H. serrata*) seems to be an uncommon pest" (Lieut.-Colonel Yerbury). This statement appears to me to be significant, and I am convinced that it is worthy of further investigation.

In the course of the summer two other flies were found infested with mites, one a Sand Fly, *Ceratopogon* sp.?, the other I cannot name; it annoys cattle, however, by sucking up the serum which exudes from the wounds made by other flies. The Sand Fly has been scarce this summer, but as in the case of the Horn Fly, further evidence is needed to see if other influences rather than the mites were not the cause of their diminution in numbers.

I am indebted to Dr. J. G. Rutherford, C.M.G., Veterinary Director-General, for permission to publish this note.

EXPLANATION OF FIGURES ILLUSTRATING DR. HADWEN'S PAPER.

Figs. i, ii and iii.—*Pigmeophorus americanus* Banks.

Fig. iv.—Tyroglyphid Hypopus.

Fig. v.—*P. americanus* on *H. serrata*.

(Original photographs by S. H.)

Note on Dr. Seymour Hadwen's Paper.—The Horn Fly, *Hematobia serrata* Rob. Desv., was first recorded in Canada in the summer of 1892, when it caused considerable alarm in Ontario and Quebec. The species of mite infesting *H. serrata* has been kindly identified by Dr. Nathan Banks as *Pigmeophorus americanus* Banks. He informs me that this mite, which belongs to the family Tarsonemidæ, has been previously found in the Western U. S. on a fly of the family Platypezidæ. This species is illustrated in the accompanying figures i, ii and iii. Fig. iv, which was occasionally found, is the Hypopal stage of a Tyroglyphid mite, which is using the fly as a means of transportation. The relation of these mites to the flies upon which they are found is not always that of a parasite; sometimes they may feed, and in other instances the fly is merely acting as a disseminating agent. I have occasionally found certain Gamasid mites, truly parasitic, on dipterous insects.—C. GORDON HEWITT.

FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MILLARVILLE, ALBERTA.

(Continued from Vol. XL, p. 193, June, 1908.)

During the course of studies at my own and various other collections, I have paid far more attention to variation in colour and maculation than to structural characters upon which "Genera" are based. I am strongly of opinion that by far too little importance is usually attached to these characters in articles published on Lepidoptera on this Continent. I have no wish to under-rate the value of many structural characters in showing the relationship and phylogeny of forms. But though, theoretically, a tabulated key of genera should enable a student to identify an unknown species with far greater ease than where no such key exists, it is a deplorable fact that I have noticed some far worse mixtures of species, and often of very distinct genera, in collections owned or supervised by systematists, than in many of those of collectors who make no pretense of studying generic characters at all. It may be asked, "How can I prove it?" I can at present only offer the dried specimens themselves as evidence, it is true, and in the knowledge of many very variable species there can be no such thing as certainty, except by careful breeding from known parents. But in the case of little varying forms, there is such a thing as knowing a species by sight, and suggested errors have in very many instances been borne out by non-related, or at least admittedly disassociated points of structure.

This state of affairs is, it seems, due to several causes. Nowadays, unless a student classifies by structure and dissects, and publishes articles on these lines, his work is not considered of much value. It is too elementary! Systematic work unquestionably is of high value, but close attention to such limits the time necessary for familiarization with the species separated by its aid. Then again, most of these systematic workers direct their attentions to so many different families or orders that their knowledge becomes too general. And another reason, perhaps coincident with and resulting from both the foregoing, may be that, once their system is laid down, their work is too hasty.

Frequently in looking over other collections I have been struck by the small amount of material exposed for study, even where much more was really available. It is obvious that lack of both time and space has often been the reason for that, but it, nevertheless, suggests that variation is not studied as it might be. One notable exception was in the American

Museum of Natural History, where many and even little varying species are to be seen in long series, sometimes from one locality. Some may think that such is a waste of space, but there is this to be said in its favour, that whereas a long and picked series of one species, from one locality or many, may indicate to what extent it varies, a long series of another may indicate that that varies but little at all.

It has been admitted by many men of science that, at any rate, a very large number of so-called "genera" are purely conventional terms, for the mere convenience of the student. As an instance, let me go back twenty-one years and quote Prof. Smith's words in Bulletin No. 38,* U. S. N. M., page 6: "I had at one time the strong conviction that genera were natural assemblages, capable of strict limitation, and definite in extent. The study of a very large material since that time has convinced me that my first impression was erroneous, that genera as such are mere artificial divisions of convenience, useful for the purpose of identification, and for the expression of relationship, and that they were useful for that purpose just in proportion as they expressed clear and definite association of characters. . . . The limits to which generic division may be carried will depend entirely upon the tact and individual propensities of an author, and in a large part also upon the tendency of the time at which he is writing. After a period of wild generic creation, there comes usually a reaction, in which lumping is carried to an extreme, and this is true as to species as well as genera." Yes, and through it all the species remain the same. Like Br'er Rabbit, they "lie low and keep on sayin' nuffin'!" Yet generic division is apt to be looked upon as the acme of science, to say nothing of the designation of certain forms as "new species," without the least idea of the extent of their variation, or the character or sum of characters which, through their sundry phases of variation, may present evidence that they are alien from their allies, or at any rate from forms from which they are assumed to differ biologically. Too much is taken for granted. Too much is stated as fact that is really pure speculation, without evidence being brought forward in support of the hypothesis. It seems to me that he is just as true a student of nature who is constantly testing those facts and bringing all available evidence to bear upon them, not from one point of view alone, but from all the various sources from which it may be drawn.

*Revision of *Agrotis*.

The subject of basing specific distinctions upon slight differences of of genitalic structure, affords too wide a field to be dealt with by more than a brief remark in this article. There are many who claim, and probably few are in a position to dispute, that certain portions of the reproductive organs show greater stability than any other organs or characters in lepidoptera and other insects. Yet there are, I believe, none who will claim that they never vary at all in a species. Carefully prepared and figured organs may be, doubtless are, very highly valuable as evidence in support of or against suppositions as to unity or distinctness of species. But, admitting that they can and often do vary, why should their exponents expect others to take it for granted that differences shown do not intergrade, or to prove that they do intergrade, without themselves proffering evidence to support their hypothesis that they do not? This seems the more strange when the differences claimed to denote distinctness are between forms occurring, not side by side, but in different parts of the country, it may be on opposite sides of the continent. In other words, whilst the exponents of genitalia freely admit variation up to a certain point in one locality, and even show figures donating such variation, why should they disallow that variation may exist to the point of differences shown between races inhabiting widely different regions? The regions intervening seem to be left out of account altogether.

In the following articles I have, to facilitate reference, adhered as far as possible to the order and generic names given in my original list, which first commenced on page 40, Vol. XXXIII.

95. *Hemaris diffinis* Bdv.—This appears to be the form described by Messrs. Barnes and McDunnough as *diffinis ariadne* in their "List of Sphingidæ of America north of Mexico" (*Psyche* xvii, 190-206, Nov., 1910). The description is made from fourteen specimens from Colorado, and Manitoba is given as another locality in the list on page 201. It agrees with Holland's figure and description of *thetis* in the "Moth Book," which the authors say "he seems to have confused with *ariadne*."

99. *Sphinx vancouverensis* Hy. Edw., and var. *albescens* Tepper.—I have two males, taken probably at the Calgary town lights, by Mr. C. G. Garrett, which have the dark dorsum to thorax, and are throughout nearly as dark as my only two males from Vancouver Island. I have a still darker specimen taken at High River by Mr. Baird. One of my Pine Creek specimens is almost a connecting link. The form is not seasonal, as pointed out in the paper in *Psyche*, above referred to.

101. *Smerinthus cerisyi* Kirby.—Rather common some years in June and July playing over water just before and after dark, in company with *geminatus*.

102. *Samia columbia* Smith, var. *nokomis* Brodie.—What I have listed as *columbia* is probably referable to var. *nokomis*, articles on which appeared in CAN. ENT., XL, pp. 350-354, and 373-376, Oct., 1908. The types of *nokomis* came from Carberry, Manitoba.

103. *Scepsis fulvicollis* Hbn.—Red Deer River, July 5th, 1905, at light. High River (Mr. Thomas Baird). It is probably not rare on the prairies.

105. *Hypoprepia miniata* Kirby.—Two more specimens from Pine Creek are dated July 22, 1906, and I have occasionally taken others.

106. *Celama cilicoides* Grt.—Sir George Hampson so named a specimen I sent him of the species I listed as *pustulata*, the type of which, and of *nigrofasciata*, are in the British Museum. He figures neither, but figures a female as *cilicoides* from the Grote collection, which seems browner and less marked than any of my specimens.

107. *Eubaphe immaculata* Reak., var. *trimaculosa* Reak., is the correct name for this form, according to Dr. Dyar. Specimens which I took at Windermere, B. C., in July, 1907, and which he called typical *immaculata*, have a pinkish tinge, and as a rule less of the fuscous border to secondaries, and sometimes lack the discal spot. One in my Calgary series lacks the border, but none completely lack the spot. In both series the border is sometimes broken into three blotches. A specimen from Stockton, Utah, is quite immaculate. Two from Chicago, sent by Mr. Kwiat, as *immaculata*, have discal spot, and one or two marginal blotches, but are ochreous rather than pinkish. Specimens received as *aurantiaca* from the same source are, in the male, more like the Calgary form in colour, but have narrower, darker and more even border, and are smaller. The females are of a more crimson red than the males, or than my only Calgary female. Four Chicago males which Mr. Kwiat sent as *rubicundaria*, are like his *aurantiaca* males, but immaculate. One is almost exactly like the Stockton specimen, but shorter in wing. The Calgary female and one male have whitish spots below the cell, as in Grote's *quinaria*, which is referred as a variety of *aurantiaca* in our lists. A series I saw in Mr. Baird's collection at High River were less maculate than the average of mine. I have met with no more females besides the one

previously mentioned in my list, but have one from Edmonton taken by Mr. F. S. Carr on 7, vii, 10, which is like it as to maculation, but has secondaries almost crimson, as in the Chicago specimens referred to as *aurantiaca*.

110. *Neoarctia beanii* Neum.—The larva has been described by Mr. Gibson, from Sulphur Mountain, Banff, found by Mr. Sanson. (CAN. ENT., XLI, 400, Nov., 1909). Mr. Bean had previously briefly described it in XXIII, 124, 1891. He also found a larva on Mt. St. Piran, Laggan, in the middle of July, 1893, which produced a moth on Aug. 20th. "St. Piran" is the correct name for the mountain I have sometimes referred to as "Piran," and which was at one time called "Niblock."

111. *N. yarrowi* Stretch.—Mrs. Nicholl took a specimen on a rock slide above Lake Louise, about July 20, 1904.

112. *Phragmatobia fuliginosa* Linn.—Occasionally met with since, but I have never found it common. May 5th, 1906 (in sunshine), and May 20th, 1907.

113. *Arctia caja* Schrank.—Mr. Baird takes the species rather commonly at High River, and sent me some labelled "var. *Wiskotti*," on whose authority I know not. The secondaries incline to pale orange rather than red, but I have seen nothing approaching what Holland figures as *Wiskotti*, from Colorado. Specimens from Vancouver have secondaries scarcely darker. I have seen specimens taken in Calgary, but have none of them in my collection.

114. The species is that figured by Holland as *Hyphoraia parthenos* Harr., and agrees with Hampson's description of *parthenos*, and not of *lapponica*.

115. *Apantesis virgo* Linn.—Another male at light here, July 27, 1907. Another taken by Mr. Hudson on July 20, 1906, also at light, is of the variety *citrinaria* N. & D., having pale straw yellow secondaries instead of red.

116. *A. virguncula* Kirby.—Occasionally taken since.

118. *A. parthenice* Kirby.—I have twenty-one males and three females in my series, carefully picked from a large number of specimens through a course of years. There is a tendency to melanism in a few examples. The inner transverse white line is either obsolete or defined merely by a spot on the costa. In one specimen only it is visible as a dot

in the cell. The second or middle line is obsolete in one, and reduced to a mere dot in the cell in three or four more. The third is occasionally broken, or very fine and reduced, and in one specimen almost obsolete. A male taken at light by Mr. Hudson on July 20th, 1906, has the secondaries yellow instead of red, slightly tinged with orange centrally. Dr. Fletcher referred it to this species. It is strange that this and the *citrinaria* above referred to should have been taken on the same night.

127. *Parasemia petrosa* Walk.—Had I studied Mr. Bean's article more closely, I should, as suggested by recent correspondence with him, have thus named my species rather than *plantaginis*, which does not seem to be properly referable to any known North American form. A form sent me by Dr. Fletcher from Nepigon, Ont., as *Selwynii* Hy. Edw. (= *Scudderi* Pack.) differs in some respects from anything yet taken in Alberta either by Mr. Bean or myself, and is, Mr. Bean tells me, claimed to be constant in its locality, and not unlikely distinct.

128. *Halisidota maculata* Harr.—I may add *Acer negundo* as a food-plant.

NOCTUIDÆ.

132. *Acronycta canadensis* Smith.—There is only one specimen now in my collection which I feel sure is the same species as the type. This is a female dated July 13th, 1899. It is the one previously referred to as labelled "like type" by Prof. Smith, and "*lepusculina* Gn." by Sir George Hampson. The latter determination would probably now be revoked, as he figures a female from Hudson's Bay under "*canadensis*" as a species. It may be the same as mine, but is not obviously so. The figure does not happen to be a very good one of the specimen. I have re-examined the type, but beyond suggesting that it shows affinities to both *felina* and *cretata*, I dare form no opinion at present as to its true status. Hampson claims that *insita* of Smith and Dyar's "Monograph" is *lepusculina* Gn., and renames their *lepusculina* as *chionochoa*, figuring a male from Iowa, but making no type. I mention this to explain the former reference of *canadensis* to *insita* by Smith, and to *lepusculina* by Hampson. *Insita* Walker appears to have preference over *denvera* Smith. I have reasons for doubting whether either *insita* or *lepusculina* of Smith and Dyar were pure.

133. *A. cretata* Smith.—I took a fine series of this species at treacle, between June 22nd and July 16th, 1909, and its distinctness from *canadensis* stands out quite clearly. It was described from one male and two

females from Garfield Co., Colo., 7,000 ft., and a female co-type is excellently figured by Hampson. The other pair stand as types in the Washington Museum, and both are figured in the Monograph. I have serious doubts whether these two types are one species. The male, as stated under the description, is a good deal smaller than its female, and lacks the contrasting sharp written black markings of the other two females, and of all my specimens. It seemed to me to agree very closely with one or two specimens standing, I thought correctly, under *populi*. But at any rate the name should probably stand for the female. The ground colour is the whitest of any North American *Acronycta* known to me. I once thought it was the western form of *populi*, but have abandoned that idea. I have a specimen from Winnipeg, and one from Montreal, from Mr. Winn. It is broader winged than *populi*, has less acute apices, whiter ground, and while the maculation is blacker and more contrasting, the powdering is less evenly distributed and seldom as heavy. The orbicular is very small, round or nearly so, and often reduced to a mere black point. There are numerous other differences. In fact, it is a closer ally of *leporina* Linn, of which I have a fine pair from Cartwright, Man. These have a slightly creamy ground, and much less of both the powdering and maculation. They differ in these respects somewhat sharply from the whole of my *cretata* series, but had I not *cretata* from Winnipeg I should have suspected the Cartwright specimens of being a local variation. I expect shortly to have European *leporina* to compare. Dr. Dyar, in his "Kootenai List," gives three names as probable varieties of *leporina* Linn., "*vulpina* Grote, Atlantic coast; *cretata* Smith, Colorado mountains, and *moesta* Dyar, eastern B. C." The type of *vulpina* I have not seen. If the pair I saw standing in the Washington collection are true *vulpina*, my Cartwright specimens are probably the same species, which seems likely to prove distinct from *cretata*, to which I have no hesitation in now referring *moesta* as a suffused form.

134. *A. manitoba* Smith.—One worn specimen on the Red Deer River, N. E. of Gleichen, on July 6th. 1905. I have examined a large number of this species from Cartwright and other points in Manitoba, and have a good series. Its nearest ally seems to be *furcifera*, than which it has paler ground colour, is more strigate, and has all the dark shades blacker. My material in *furcifera* is, however, deficient, and I have none from Manitoba or westwards. Holland's figure under *furcifera* appears to me to be *manitoba*. It is a trifle too brown, which may be accounted for by the tint of the plate. The species I refer to as *furcifera* is that figured

by Holland as *hasta*. The *hasta* of Hampson's Catalogue is *pruni* of Smith and Dyar. I have seen types of neither *hasta* nor *furcifera*.

136. This should be *A. grisea* Walker, some Alberta specimens agreeing well with Walker's type from "Hudson's Bay." The anal dagger in my series varies somewhat in thickness, but is lacking from none, as it is from Hampson's figure of an Alberta specimen. In the Kootenai List, Dr. Dyar refers the Kaslo form to "*grisea*, var. *revellata*," and implies that Kaslo larvæ are like larvæ of eastern *grisea*. *Revellata* was described from Salida and Glenwood Springs, Colo., and is larger and a little darker than the average run of Calgary specimens, with the anal dagger rather heavier. The male type at Washington is somewhat fuscous and like Kaslo specimens. The female type is bluer and like Vancouver Island specimens in the same collection. A few of my Calgary examples, if mixed, could probably not be picked out from a Kaslo series, and I have no reason for considering the names to refer to two species. Dyar gives birch as the food-plant of both forms. I have not discovered its food-plant here, but know of no birch within two miles, though the moth is sometimes common.

138. *A. illita* Smith.—Specimens from Aweme, Cartwright and Miniota, Man.; Kaslo, B. C., and Duncans, Vanc. Is., are all much like my only Alberta specimen, and all are dark, somewhat suffused, but blue-gray, not brown as in Hampson's figure, which is poor. The species was described from Denver and Glenwood Springs, Colo. Dr. Dyar, in the Kootenai List, calls Kaslo specimens "*impleta*, var. *illita*." My *impleta*, from New Brighton, Pa., New York and Montreal, are paler and less contrastingly marked. I have no actual intergrades, nor did I notice any when at Washington, yet I can see nothing contrary to Dr. Dyar's opinion.

139. *A. emaculata* Smith.—The male type in Prof. Smith's collection is from Calgary, and I have a specimen labelled by myself as almost a dead mate to it. A Calgary specimen very like it is well figured by Sir George Hampson. The female type is in the Washington Museum, and is from Easton, Washington. It is very dark and uniform, with no contrasting shades. These two specimens form the whole of the type material. Hundreds of Calgary specimens have passed through my hands, and I have over forty picked specimens in my series now, but have seen none as evenly dark as the female type. But a Kaslo female in the Washington Museum is extremely like it, though having a trifle more contrast

in shades. I should say they are unquestionably the same species. Feeling very hazy about the distinctions between *impressa*, *emaculata* and *distans*, I submitted two pairs from Calgary to Dr. Dyar a few years ago for his opinion. He replied that none were *emaculata*, and returned two as *distans* and two as *impressa*. Those sent as *distans* are the darker, and have distinct submedian dark shading from the base to the anal angle almost unbroken. The others lack this shade almost entirely, and are pale, like my *impressa* from the east. These characters are used in separating the imagines in the monograph, and a pair are figured under each name in accordance, *distans* being shown to have also slightly narrower wings and more pointed apices. But following up these characters through my series, and using my two labelled pairs as leaders, I entirely failed to divide them into two series, nor could I do so by the help of any other characters, either then or on the many occasions upon which I have made the attempt since, after examining fresh material in the Washington collection, where there is a good series under both names from many localities.

At the British Museum in February and March, 1909, I was unable to follow out Sir George Hampson's separation of *distans*, *impressa* and *emaculata*. The types of *impressa* and *fasciata* Walker, from "Hudson's Bay," and Grote and Robinson's *verrillii*, from Cambridge, Mass., are pale blue-gray, and seemed to be one species, as catalogued. But other specimens associated with them and with *distans*, seems to me to fit *emaculata* equally well.

In the *distans* series I made careful notes on a male and three females, which seemed different from the rest of the group, and from any that I had seen before. Of these, one was the male type from Montreal, which appeared to be the one figured in plate cxxvi, 21, of the Catalogue. One female was from New York, and labelled "*brumosa*," presumably by Grote. The other two bore no locality labels, but I judge from the Catalogue that they were from the same localities. These four seemed to have creamier ground, and to be browner and more smoky than any of the rest, and to have wider space between the t. p. line and termen, with wider, larger pale spots constituting the s. t. line. These then are all typical *distans*. I spent a lot of time trying to persuade Sir George that some of the Calgary specimens belonged to these and others did not, though all differed in colour, none being brown or smoky, but rather blue-gray. A male under *impressa* marked "New York Garrison, Cockerell," also seemed to me to be *distans*. But on my return to Calgary my attempt

to make a satisfactory separation in my series on the above characters (eliminating the mere colour difference) proved abortive.

I marked a specimen in Mr. A. F. Winn's collection at Montreal as typical *distans*, and have two males from Mr. J. D. Evans, of Trenton, Ont., which seem to fill the bill. My notes on the Washington collection are: "Not one typical *distans* in the whole long series under this name, and a few seem undoubtedly *impressa*." And "several under *impressa* are typical *distans*, though others are typical *impressa*." I am of course making no claim to ability to define the limits of *distans*, nor always to recognize it when I see it, but am merely diagnosing the typical form. Granted that larval differences claimed by Dr. Dyar may signify the existence of two species, it has, I think, yet to be shown that they are *distans* and *impressa*. At any rate, the progeny of known females will have to be carefully compared before the limits of variation in each can be learnt. In Dr. Dyar's list it is signified that the larval descriptions given under the two names in the Monograph were reversed. Sir George Hampson associates them accordingly.

I have at present no reason whatever for supposing that *emaculata* male is a good species. It is more like the type of *impressa* than of *distans*, but beyond that I dare not venture at present. Mr. Heath claims that he can recognize two distinct forms at Cartwright, which appear at different dates, but I have not succeeded in dividing material received from him supposed to contain both. During 1909 I selected from treacled posts about a hundred good specimens, ranging from about June 10th to July 14th, but though the variation is considerable, and includes forms like eastern *impressa*, I noted nothing in their dates, habits or appearance to help me in a separation.

I am inclined to consider *dolorosa* Dyar, from Kaslo, the same species as *emaculata* female type, and not distinct from the Kaslo female referred to under that name. The form seems to me to connect female *emaculata* with its male, and to be actually nearer the type of *impressa* than of *distans*.

141. *Hadenella tonsa* Grt.—In Dyar's list *subjuncta* Smith is referred as a synonym of *minuscula* Morr. Prof. Smith, in Trans. Am. Ent. Soc., xxix, 194, states that it has nothing in common with *minuscula*, but is a synonym of *tonsa* Grt., and that he had studied the types of all three. He so refers it in his Check List. In the Kootenai List Dr. Dyar accepts this change, recording *tonsa* from Kaslo, and stating that the specimens agree with *subjuncta* type. As to the lack of close relationship

to *minuscula*, I am willing to accept Prof. Smith's word. As to *tonsa*, I have seen the type in the British Museum, a female from Nevada, and am inclined to agree with Sir George Hampson in considering it distinct from the Calgary species which he figures as *subjuncta*, and which is the form that has for years stood in my collection as such, and was previously listed by me as *tonsa*. In the Washington Museum are male and female types *subjuncta* from Glenwood Springs, Colo., a female co-type "Colo.," and a pair of co-types from Calgary. The female type and the other Colo. female appeared to me to be *tonsa*. The variation puzzled me a bit, but I have come to the conclusion that the male type and Calgary male co-type, which are alike, must be *tonsa* also. There were also in the collection Kaslo specimens, and a female from Williams, Ariz., which agreed with the female type.

I possess as *tonsa*, females from Kaslo and Prescott, Ariz., from which latter locality there is one in the British Museum, agreeing with the type. This is dark gray, suffused, blackish centrally, with spots outlined in black, and claviform well defined, moderate in size. Kaslo and Arizona specimens differ principally only in being slightly brown-tinged. But, with one exception, all my Calgary series (*subjuncta* Hampson, probably on my authority) are very much paler, scarcely suffused, reddish-brown tinged, and the spots are not distinctly outlined in black. The claviform in none is distinctly outlined, is very small where discernible, but as often as not entirely lacking. Similar Calgary specimens are at Washington. They may grade through to *subjuncta* Smith, = *tonsa* Grote, but I was unable to decide. From my own material I should not suspect it. *Subjuncta* Hampson, which is also the *subjuncta* of Holland's figure, is very near *semicana* Walker, which is the species known in eastern collections as *hausta* Grote, of which I have not yet seen the type. Hampson places them next one another in the genus *Oligia* Hubn. *Semicana* is shorter-winged, and has them proportionately a little broader near the base. He separates them in the table by *subjuncta* having the terminal area darker than subterminal, as against "not darker" in *semicana*. This seemed correct, and I noticed that *semicana* had a more cream-coloured ground. But this scarcely holds in my own series from New Brighton and Oak Station, Pa., in which the diffuse pale s. t. line is crowded closer up to the hind margin (termen) than in the Calgary form, though such margin as it leaves is dark. Barring that and the wing form, my two series are exactly alike. The locality of type *semicana* is known merely as "U. S. A."

143. This form is *Caradrina nitens* Dyar without a doubt. The seven types are all males. Four are from Kaslo, and the other three from Turtle Mountains, N. D., which according to my atlas are continued across the boundary into Manitoba. The average of Calgary specimens are a little larger, darker and narrower of wing than my series under *miranda*, from New Brighton and Pittsburg, Pa., Lawrence, Kan., and Chicago, Ill. But these differences are not constant. I can match Chicago and Calgary males, good fresh specimens too, in every detail. Unfortunately, out of a series of sixteen local specimens, only two are females. These do not differ in secondary structure from the males, having slender thorax, and long slender abdomen. Six of my *miranda* series are females, out of thirteen. These all have more robust thorax and abdomen, and the latter is also shorter, not exceeding the anal angle of the secondaries. This character may or may not denote a distinct species, but, not to commit myself further, I expect at any rate that *nitens* occurs at Chicago. There is no type of *miranda* in the British Museum, nor have I any note of the series there, but Sir George Hampson states that *nitens* has a white point in the reniform which *miranda* lacks. This does not hold in my series either, as the majority in both have white points. It looks to me as though Dr. Holland, on Plate xix, fig 20, had figured *miranda* female as "*Orthodes vecors*, male." The series under *miranda* at Washington, on the strength of which *nitens* was described, may prove to be a mixture, but in this I may be wrong, except as to the distinctness of a worn male from Kaslo, like which I have two fine specimens from the same locality, and have seen others. These are, as Dr. Dyar remarks in the Kootenai List, "large and grayish powdery," and have the t. a. and t. p. lines faintly indicated as broad, diffuse striæ, with uniform, slightly smoky secondaries.

144. *C. punctivena* Smith.—The type is at Washington, and is a male labelled "Laggan Sta., N. W. T., Bean."

{ 145, *Hillia senescens* Grt.

{ 146. *H. vigilans* Grt.—As to the relationship of these two forms, I have been able to discover nothing more than I knew when I previously published. I have, however, compared specimens with both types, and the names are correct. The type of *senescens* is a female from Lewis Co., N. Y., and *vigilans* is also a female, from Orono, Maine. Sir George Hampson makes both synonymous with *iris* Zett., which was described from Lapland. About *crassis*, which he makes the first synonym and "ab. l." of *iris*, I know only what I have read in catalogues. It was

described apparently from Europe, and Hampson's description reads like *senescens*, which is in accordance with Prof. Smith's diagnosis of the *crassis* of the Berlin Museum. Type *semisigna* Walk., a female, locality unknown, is a very badly rubbed *senescens*. I have no note that I have anywhere seen any intergrades. The black specimen referred to in my previous list as destroyed, was in all probability *maida* Dyar, which has recently been taken at Banff.

148. *Luperina niveivenosa* Grote.—This is prior to *viralis* Grote, and Sir George Hampson places the species in Volume IV in his new genus *Protagrotis*. The type of *viralis* is in the British Museum, and is a very badly rubbed male from Nebraska. The reference to *niveivenosa* was shown in the collection when I was there, though it had not been known when Vol. IV was published. The woodcut of *viralis* is very poor, owing to the bad condition of the specimen. Prof. Smith in his Catalogue states that the type of *niveivenosa* is in the Graef collection. The description was made from a single good specimen from Colorado, and this, a female, is in the American Museum of Natural History, from the Henry Edwards collection. I saw no type in the Graef collection at Brooklyn. Grote described both as *Agrotis*. I examined the tibiæ of neither type, but that of *viralis* is stated to have a spine between the two pairs of hind tibial spurs. I find this in two out of six specimens that I have so far examined, and am not assured of its absence from the rest.

149. *Hadena passer* Guen.—I have seven Calgary specimens in my series at present, and have never taken many more. I am not sure as to the extent of variation in this species. The type, a male from Trenton Falls, New York, is in the British Museum, and is an even-coloured specimen, fairly well figured in the Catalogue, though the broad blackish t. p. line from the costa to opposite the reniform is a mistake of the artist. Type *loculata* Morr., from Evans Centre, is there also, and is like it but more even. Type *incallida* Walker, from Trenton Falls, is, my notes tell me, like my specimen previously listed as No. 155, wrongly as *morna*, though I had not this specimen with me to compare. My specimen is pale ochreous except on costa, termen and central band to just below the median vein. Hampson's "ab. l. *conspicua*" is like this, but has the central band fairly complete. Type *conspicua* is stated to be in the Tepper collection. I am not quite confident that my supposed *incallida* specimen will not be found to belong to another allied species. Of this latter I have one male taken here on July 9th, 1907, and one from Mt. St. Hilaire,

Quebec, July 1st, 1899, through the kindness of Mr. Chagnon, who showed me a short series taken at the same time and place. This is apparently one of two species which I found standing wrongly in the Washington collection, in different drawers, as *morna* Strecker, and there were specimens of it from Wellington, B. C., Raleigh, N. C., and Silverton, Colo. I can identify it at present with no known name, and have given it one in my manuscript notes for my own convenience, but will not publish until I have had opportunities for further study. It shows stronger contrasts of colour than *passer*, having paler ground, and dark shades blacker, and mine have more whitish in the reniform.

NOTES ON ORTHOPTERA.

BY A. N. CAUDALL, WASHINGTON, D. C.

Mr. Chas. Schæffer, of the Brooklyn Museum, recently sent Mr. Banks a number of Neuroptera for identification. Among this material was one specimen labelled "*Mantispa* sp. Neuropt," which proves to be a male specimen of *Mantoida mays* S. & Z., a little Mantid very like, in general appearance, the members of the Neuropteroid genus *Mantispa*. The locality label was only "Florida," and, as the species was described from Northern Yucatan, it seemed doubtful if it was really from Florida. The specimen bore an accession label, so Mr. Banks wrote for further information regarding it. Mr. Schæffer replied, assuring him that the specimen was from Florida, probably from Kissimmee, and was from the collection of Charles Palm.

This is an interesting addition to the list of United States Orthoptera, being the only representative of its subfamily, the Eremiaphalinæ, found in the nearctic fauna.

The genus *Parabacillus* of Schulthess¹ is preoccupied by the genus of the same spelling erected by the writer some years ago.²

The genus *Lophotettix* of Bruner³ is preoccupied by *Lophotettix* Hancock.⁴

Tettigidea australis Bruner⁵ is preoccupied by *Tettigidea australis* Hancock.⁶

1. Mitth. Schw. Ent. Ges., Vol. xii, p. 8 (1910).

2. Proc. U. S. Nat. Mus., Vol. xxvi, p. 865 (1903).

3. Ann. Carnegie Mus., Vol. vii, p. 137 (1910).

4. Trans. Ent. Soc. Lond., p. 388 (1909).

5. Ann. Carnegie Mus., Vol. vii., p. 132 (1910).

6. CAN. ENT., Vol. xxxii, p. 26 (1900).

STUDIES IN THE LIFE-HISTORIES OF CANADIAN
NOCTUIDÆ.—I.*

BY ARTHUR GIBSON, OTTAWA, ONT.

MONIMA REVICTA MORR.

Eggs of this species were received from Mr. Theo. Bryant, of Wellington, B. C., along with the captured ♀ which laid them. They were deposited on the 26th April, 1904, and hatched on the 9th May—duration of egg state 13 days.

Egg.—Spheroidal, the base flattened; pale yellowish; 0.8 mm. in diameter; about 44 ribs, cross-striæ distinct. Laid singly.

Stage I.—Length when hatched 2 mm.; pale lilac before feeding, after feeding pale green. Head 0.4 mm. wide; bilobed; testaceous, mouth-parts darker. Cervical shield concolorous with head. Body cylindrical, skin smooth and shiny. Tubercles black, shiny, single haired setæ black. Second day after hatching indistinct stripes are noticeable on the body. On the third day, under a lens, these are distinct; in colour dull reddish, and are as follows: a stripe between tubercles i and ii, another stripe, more distinct, almost midway between tubercles ii and iii, and still another stripe running through tubercle iii. There is also a sub-ventral stripe running through tubercle v. At this time the skin between tubercles iv and v is pale bluish. Feet darker than body, front two pairs of prolegs aborted. Larvæ loop when walking.

Stage II.—Length, 6 mm. Head 0.65 mm. wide, rounded; pale luteous, darker at vertex. Ground colour of body dark green, almost a bottle-green, still darker laterally, with a decided burnt-umber tinge. Dorsal stripe pale bluish; sub-dorsal stripe of same colour, just below tubercle ii; lateral stripe, just above tubercle iii, also of same colour, but not so wide or so conspicuous as the sub-dorsal stripe; stigmal band very wide and conspicuous, extending along the whole side of the body and on to the anal prolegs. Tubercles small and black, each with a black, short hair. Spiracles black in front of tubercle iv. Feet concolorous with venter; prolegs darkened exteriorly. First pair of prolegs aborted, the larvæ still looping when walking. Later in the stage the colour of the skin laterally, just above and below the stigmal band, becomes more of

*Contributions from the Division of Entomology, Ottawa.

a reddish-brown, as does also the whole dorsum of segment 13 and part of segment 12.

Stage III.—Length, 11.5 mm. In general appearance the larvæ are now dark purplish-black, with a conspicuous white stigmatal band. Head 1.0 to 1.1 mm. wide; honey colour, darkened at vertex. The larvæ in this stage are darker than Stage II, and the markings on body are more distinct. The dorsal stripe is wider and more apparent than the sub-dorsal and lateral stripes; all these stripes pale blue. The lateral stripe is the least conspicuous. Stigmatal band creamy-white and very distinct. Under a lens the colour of the skin of body above the sub-dorsal stripe is almost a bottle-green, with small, pale bluish and blackish mottlings. The dorsal stripe is narrowly margined on either side with black, as is also the upper edge of the sub-dorsal stripe. The colour of the skin between the sub-dorsal stripe and the stigmatal band is almost a clove-brown. Skin below spiracles dark brownish, becoming paler and of a bluish tinge towards centre of venter. Tubercles small, black. Spiracles round, black. Thoracic feet semi-translucent, dark at tips; prolegs sordid-white, darkened exteriorly towards base.

Stage IV.—Length, 18 mm.; Head 1.6 to 1.75 mm. wide; testaceous, reticulated with darker brown; ocelli black. Body purplish-black, the skin above the sub-dorsal stripe with a greenish tinge, throughout which are numerous streaks and dots of black. The stripes on the body are the same as in last stage. The creamy-white stigmatal band is even, wide and very conspicuous. The spiracles are black, elliptical in front of tubercle iv. Tubercles black, small and inconspicuous. Thoracic feet rather translucent, with a brownish tinge; prolegs pale, darker towards base. Venter slightly pruinose, more apparent in some specimens than in others. The larva is a beautiful creature with its dark body, pale bluish stripes and prominent stigmatal band.

Stage V.—Length, 22 mm. Head 2.3 to 2.5 mm. wide; reticulated with brown, as in last stage; an oblique, wide band of brown crosses upper portion of each cheek. The larvæ are now altogether different from previous stages. The colour of the dorsum from the sub-dorsal stripe on one side to the sub-dorsal stripe on opposite side is dark yellowish (yellowish-green in a few specimens), blotched with brown. The tubercles within this area are circled with white. This yellowish colour of dorsum

becomes more distinct as the stage advances. The skin below this, to the wide creamy-white stigmatal band, is rich brown with a purplish tinge. Spiracles black. Below stigmatal band the colour is seal-brown, dotted with white; the venter is slightly pruinose. In some specimens the distinct stigmatal band is edged within with pale (but bright) yellow. Dorsal, sub-dorsal and lateral stripes distinct, but broken in places.

Stage VI.—Length, 30 mm. Head 3.2 mm. wide; markings much heavier than in Stage V. The larvæ in this stage are much the same as in Stage V. The stripes above the spiracles have become less distinct. In some specimens the lateral stripe is almost obliterated. The stigmatal band is now not clear, as in former stages, but is blotched, particularly in the centre, with the same brownish colour of the skin of the body. In some specimens almost the whole of the stigmatal band bears these blotches. Spiracles black. Tubercles minute and inconspicuous. Body colour same as in last stage, below stigmatal band with a distinct purplish sheen. Thoracic feet pale brown; prolegs concolorous with venter.

Length of mature larva 42 mm. at rest, when extended 47 mm.

On June 2 the first larva to burrow entered the earth, and others followed soon afterwards. The oval earthen cocoon made by the larva is similar to that made by many other noctuid larvæ; no silk could be detected.

Pupa.—Length, 18 mm, width at widest part 6 mm., dark chestnut brown, shining; abdominal segments roughly pitted on anterior half; spiracles black. Cremaster blackish, rough, terminating in two long, excurved, stout spines, on either side of each of which there is a short thick spine, and in front of these latter two other spines, all, also, excurved; all the spines dark reddish brown.

The moths (7) emerged in a cool cellar during the latter half of March, and early in April of the following year. The specimens are remarkably alike in appearance, the general colour of the primaries of all being bluish-gray. They vary in expanse from 40 mm. to 44 mm. The moth is well illustrated in Hampson's Catalogue of the Lepidoptera Phalænæ in the British Museum, Vol. V, pl. xc, fig. 24.

Food-plant.—The larvæ were offered apple, willow, poplar and birch, but only ate willow and poplar, preferring the former. Latterly they were reared to maturity on willow.

THE LIFE-HISTORY OF *CHRYSOPHANUS DORCAS* KIRBY.

BY WILLIAM W. NEWCOMB, M.D., DETROIT, MICH.

Ever since I began to study *Chrysophanus dorcas* in the summer of 1908, I have especially desired to work out its life-history, but I have only accomplished this the past year (1910). During the first season in which I attempted to find the eggs* I met with considerable success, at least after three or four weeks' effort, and secured an abundant supply, mostly from caged females. I had not then discovered the best way of carrying the eggs over the winter (this was in 1908-1909), with the result that in the following spring they failed to hatch, except one lot, which had been found in the open. Unfortunately the latter, about 25 in number, had been overlooked at the time, and, when discovered, all but two or three of the caterpillars, which lived only a few hours, were dead.

It was not until the fall of 1909 that I had an opportunity to look for more eggs. On October 4th I paid another visit to the Bloomfield bog, and after three or four hours search on the leaves of the cut shoots of *Potentilla fruticosa* I found some 150 eggs, only a few of which were evidently unsound.

The method I employed in caring for the eggs during the winter (1909-1910) was as follows: I placed the leaflets with the attached eggs in small vials, to each of which was added two or three drops of water, which was repeated the following spring whenever the leaflets began to dry up. The tops of the vials were open to the air with a cover of gauze, and during the winter they were kept in an outside shed, so that the conditions might be nearer to those to which the eggs are subject in nature.

The winter, fortunately, was an evenly cold one. On March 19, 1910, fearing that the spring changes in temperature might affect the successful hatching of the eggs, I divided them into two lots, one of which was placed in an ice-box and the other lot returned to the shed. As it afterwards proved, this was unnecessary, for eggs of both lots hatched well, yielding healthy, vigorous caterpillars. I am now satisfied that my failure in getting the eggs to hatch upon the previous attempt was due in part to the changeable temperature of a warm winter, but, undoubtedly, more largely in not providing them with sufficient moisture.

The first eggs hatched on April 10, 1910. As soon as the eggs were found to be hatching, both lots were brought into the house and were, of course, under the same conditions, except, perhaps, as chance left the

*For information on the egg-laying habits and other observations on the biology of this species, see CAN. ENT., 41: 221-229.

May, 1911

leaves in one vial slightly damper than those in another. The eggs continued to hatch until April 25th, when a total of 109 caterpillars had emerged. The majority came out on the 18th, 19th and 20th: 19, 31 and 15 caterpillars, respectively.

I think one observation indicates quite clearly the necessity of providing sufficient moisture for the eggs. Up to April 15th 24 eggs had given caterpillars from the lot that had been kept in the shed all the time. No more hatched from this lot until the 23rd, although in this interval a majority of all the caterpillars had come out of the eggs that had been kept for a period in an ice-box. On the morning of April 23rd I moistened the leaves in the vial, which had become dry and from which no eggs had hatched for the past eight days. At 10 p.m. on the same day three more caterpillars had hatched, thus showing quite conclusively, I think, the need of moisture, at least, during the period of hatching. This is what we should expect, as the fallen leaves lying beneath the cinquefoil bushes must become very wet in the spring from the melting snow and ice.

At first I did not know the best way of caring for the caterpillars, for they were so small. After a few days, however, I hit upon a plan which proved very successful.

For breeding cages I used a large number of tube or shell vials of two sizes, 25 x 60 mm. and 35 x 72 mm. In each of these was placed a layer of sand to the depth of about 15 mm., which was kept well moistened. To prevent the escape of the caterpillars, the top of each vial was covered with a thin piece of gauze, held in place by a rubber band. A tiny spray of cinquefoil stripped of its lower leaves, pushed into the wet sand, furnished food. To transfer the caterpillars I used a wooden match sharpened at one end.

For those caterpillars which I desired to keep under special observation, I used the smaller vials, a single specimen to a vial. In providing individual homes for them in this way I could readily keep track of each caterpillar, notwithstanding its small size, and, best of all, as the food-plant kept fresh and green, it was only necessary to disturb the caterpillars about once in four or five days until after the third ecdysis. Then, as they were eating more, food had to be supplied oftener. In the larger vials I kept several caterpillars, but I could not, of course, watch each individual one so closely. Fortunately, I had a good supply of *Potentilla fruticosa* in my garden, for the caterpillars preferred the tender opening leaflets to the fully-opened leaves.

In Southern Michigan the life-history of this species in brief is as follows: The eggs are laid during the latter part of July and the first part of August. They are placed on the under side of the leaflets, and drop with the leaves to the ground in the fall, where they remain, more or less covered by snow, until the following spring. I have not gathered the fallen leaves and searched them for the eggs, but that the eggs are there during the winter I can entertain no doubt, a point, however, which I shall hope sometime to demonstrate. The caterpillars emerge from the eggs during the middle of the following April. There are five instars, and the majority of the bred specimens reached the chrysalis between the 15th and the 20th of June, and the butterfly between the 26th of June and the 2nd of July. In the bog I believe these dates would be about two weeks later, as the conditions indoors were probably more favourable to rapid development than they would be outdoors, and this corresponds better so far as my observations have as yet gone with the dates of appearance of the butterflies in the field. This is further confirmed by the following: Of 14 caterpillars found in a bog near Ann Arbor, I raised 8 to maturity. These yielded butterflies from July 16th to 22nd, dates considerably later, but, on June 13th, 1910, when this lot was secured, all of these caterpillars, except one, were in the third instar, while on the same date nearly all of the egg-bred caterpillars reared within doors were in the fifth instar, many nearly ready for the chrysalis, and two had already changed. It will thus be seen that from the time the egg is laid to the death of the resulting butterfly about one full year is taken.

I kept records of the time passed in the different instars and chrysalis of as many examples as I could. The table below shows the average number of days passed in the different instars and chrysalis, and also the shortest and longest time spent in any instar or chrysalis.

Instar.	Number of specimens.	Average number of days.	Shortest time.	Longest time.
First	41	18.6	13	30
Second	28	12.3	9	16
Third	26	8	5.5	12
Fourth	26	10.7	8	13
Fifth	27	13.8	11	18
Chrysalis	32	10.1	8	15

I should rather have expected that the lengths of time spent in the different instars would have become successively shortened, but instead of

that we have a decrease to the third instar with an average of only 8 days, and an increase to 10.7 in the fourth and to 13.8 in the fifth. I hardly know how to account for this, as the weather was about the same during the entire period of growth of the caterpillars, particularly cloudy, gloomy and cold, conditions which were more or less reflected indoors, for the caterpillars were not kept near any artificial heat. Undoubtedly there must be many days in April and May, and even June, especially in such cold and rainy springs as the past two seasons have been in this vicinity, when the caterpillars in the open would become so chilled as to be unable to move about and feed.

There are some habits of the caterpillars which are worth noting : (1.) In emerging the caterpillar eats an irregular hole in the top of the egg, but only large enough for it to crawl through, the greater portion of the egg being invariably left. (2.) The caterpillars are very active crawlers, a fact which I learned at first to my loss, and this would seem to be necessary in nature to enable them to reach tips of the shoots of the cinquefoil, where the tender opening leaflets are to be found. (3.) Almost always after moulting I would find the caterpillar turned around, head facing its exuvia. This it seldom ate, although the position taken would seem to indicate the opposite. One example which had recently passed the first ecdysis I watched for two hours, but no attempt at eating its exuvia was made. In one instance, however, after the second ecdysis, I caught the caterpillar in the act of feeding on its exuvia. Usually I never had any trouble in finding the latter. (4.) In selecting a place to pupate, the caterpillar most often chose the under surface of the gauze cover on the vial, only occasionally the under surface of a leaflet. In the open the latter is presumably the position most often chosen.

There are two or three very interesting features in the clothing of the caterpillar and chrysalis, a description of which follows, to which I desire to call attention. I would mention, especially, the long, backwardly-curved dorsal bristles of the newly-hatched caterpillar, the numerous egg-shaped processes of the caterpillar in the later instars and the very minute wine-glass-shaped processes of the chrysalis. The significance of these various structures is not readily apparent, but when someone is able to make a careful comparative study of *dorcas* with its congeners, especially *helloides* and *epixanthe*, more light may be thrown upon the subject.

I can heartily recommend *Chrysophanus dorcas* to any one who desires to study the life-history of some Lycænid form. The fact that its eggs can be secured in numbers, with the assurance that a good proportion will

hatch and that the caterpillars can be easily reared, should appeal to teachers of zoology and insect life, especially when it is considered how readily the food-plant may be grown in the garden.

DESCRIPTION.

Egg.—Echinoid in type ; firmly attached to the leaflet by a flattened base, top flattened to a lesser extent, the centre being occupied by a moderately deep pit, at the bottom of which is a very fine network. Chalky-white when first laid, which colour is retained in those specimens kept unmoistened indoors, but is changed to a brownish in those moistened or exposed in the field. From this it would appear as if the change in colour is due to staining from the juices of the leaflet rather than anything inherent in the egg. The surface shows a raised network, the intersections of which are enlarged into blunt, thickened knobs, while the ridges between are thinner and lower. Near the base of the egg the network is finer, the spaces more numerous and the raised intersections less prominent. Two eggs gave the following diameters: Vertical, 0.45 mm.; equatorial, 0.7833 mm.; vertical, 0.46 mm.; equatorial, 0.7833 mm.

First Instar.—On emergence the caterpillar is nearly cylindrical, slightly broader in the thoracic region ; venter flat. As it grows the thorax becomes highest at the third thoracic segment, sloping gradually caudad and abruptly cephalad, and the first thoracic segment is now very large, and at least twice the cephalo-caudal diameter of the succeeding segment ; between the sutures highly arched.

Head small, rounded, dark brown, retractile ; at rest the thoracic segments are swung forward around a transverse axis, so that the head comes to lie directly underneath the first thoracic segment and is withdrawn into it.

Colour pale clay yellow or pale brown, but after feeding a few days changing to pale green ; lateral and dorsal surfaces, except for a very small central area on the dorsal surface of each segment, thickly studded with minute black dots.

Each half of the caterpillar bears six rows of prominent tubercles ; the two dorsal and the substigmatal rows give rise to colourless bristles, while the other three rows, dorso-lateral, lateral and sub-ventral, are without bristles ; the tubercles are slightly elevated above the surface, on each segment those of the inner dorsal row are placed cephalad of those in the outer dorsal row, and are at least twice the height of the tubercles of both the outer dorsal and substigmatal rows, which are very flat.

Besides the three rows of bristleless tubercles, there are four additional rows of very small tubercles: (1.) Each tubercle of the dorso-lateral row may be accompanied (but often is not) by a minute brown tubercle. (2.) Each tubercle of the lateral row is apparently always accompanied by a tubercle behind and above it. (3.) Between the lateral row of tubercles and the spiracles is a third row, while (4.) behind each spiracle is a tiny tubercle. Some of these tubercles bear tiny bristles.

The bristles of the inner dorsal row of tubercles are somewhat longer than the transverse diameter of the first thoracic segment at birth, and project in a curve that is upward, backward and a little outward; the bristles of the outer row are less than half the length of those of the inner row, are only slightly curved, and set so as to project upward, but more directly backward crossing the bristles of the inner row; on the seventh abdominal segment the bristle of the outer row is lacking.

The substigmatal row of outwardly directed bristles unites with the row of the opposite side in a continuous fringe around both cephalic and caudal extremities of the caterpillar; in length these bristles are somewhat shorter than those of the outer dorsal row; the number and relative lengths of the bristles in the row apparently are constant, excepting the first thoracic and last (ninth) abdominal segments. The number of bristles is as follows: second and third thoracic segments four each, first to eighth abdominal segments three each; not considering the cephalic bristle on the second and third thoracic segments. The relative lengths of these bristles on the second thoracic to eighth abdominal, inclusive, are: Middle bristle longest, caudal shortest, cephalic between these two, while the cephalic bristle on the second and third thoracic is slightly shorter than any of the others.

Each half of the first thoracic segment bears nine long bristles; these are placed in two irregular rows, the four bristles in the upper row being longer than the five of the lower row, except the most caudal one.

Each half of the ninth abdominal segment bears seven bristles, of which the uppermost dorsal bristle is longest, the others of shorter lengths.

The bristles of the dorsal and substigmatal rows are imbricated.

The prolegs are provided with tiny bristles.

Two small branched spines project caudad from the last segment, just below the anal opening.

Spiracles brown, which colour is retained throughout the instars.

The thoracic shield is triangular, base caudad, apex cephalad and truncated, pale brown, clearer within.

Length, 1.3 mm. to 1.5 mm.

Second Instar.—The shape is as in latter part of first instar.

Head, at first pale green, as the caterpillar gets older changing to brown; shining.

Colour blue-green. The minute black dots which studded the surface in the first instar have now entirely disappeared.

The bristle-bearing tubercles are much more numerous than in the first instar. The inner dorsal row of long, backwardly-curved bristles is conspicuous, the substigmatal fringe less so, because its bristles are somewhat shorter. Between these two series of bristles the surface is richly clothed with tubercles which bear short bristles, but the precise arrangement of these tubercles in rows, as in the first instar, is not evident.

Between the substigmatal fold, which appears as a white line, and the mid-dorsum are four faint lines interrupted at the sutures.

The thoracic shield is represented by a pit.

Mandibles brown, ocelli black, these remaining the same in succeeding instars.

Length, 2 mm. to 2.5 mm.

Third Instar.—Shape similar; the caterpillar now appears longer, however, in proportion to its width.

Head pale green.

Colour blue-green (in one example pale green), later in the instar becoming pale green.

The substigmatal fringe of bristles and dorsal row of backwardly-directed bristles are still present, the latter less curved, relatively shorter and less conspicuous; the region between these two series of bristles is well clothed with bristle-bearing tubercles, the bristles short; tubercles without bristles few. In this instar a new element in the clothing usually appears for the first time; this is an opaque, white, egg-shaped process borne by a short pedicel, the latter arising from a tubercle. These processes are few in number, irregularly placed and often found cephalad. In the examination of several caterpillars they varied in number from six to twenty-five, while in one example none at all could be discovered.

There are four faint, uneven white lines as before, the two upper ones being wider, and all becoming more distinct as the caterpillar approaches the end of the instar.

Length, 3 mm. to 4.5 mm. Average of 22 caterpillars, 3.7 mm.

Fourth Instar.—Shape as before; the arching of the segments between the sutures has gradually been reduced as the caterpillar has grown older.

Head and body colour as before.

The bristles of the dorsal rows have ceased to be a conspicuous feature of the ornamentation ; they are now but slightly curved and only longer than the other bristles from the third to the eighth abdominal segments. The entire surface above the substigmatal line is thickly studded with short bristles and the egg-shaped processes which first appeared in the preceding instar. These processes are very generally scattered over the surface, and are in all respects the same as in the third instar.

The mid-dorsal area is dark green from the underlying blood-vessel. White lines as before, except that the two upper ones are fused into one band ; all are faint.

The thoracic shield is a shallow, somewhat diamond-shaped pit.

Length, 5 mm. to 6.5 mm. Average of 27 caterpillars, 5.76 mm.

Fifth Instar.—The segments are only slightly arched.

The bristles of the dorsal rows are very slightly curved backwards, and are progressively longer proceeding caudad, from about the second to the seventh abdominal segments, where they extend a little beyond the other bristles. The longest bristles are in the frontal fringe and on the first thoracic segment between this fringe and the diamond-shaped pit of the thoracic shield. The egg-shaped processes are thickly scattered all over the surface, except on the venter.

The white lines are present now as two very faint bands, separated from each other and the substigmatal line by a faint, wavy, green line.

Length, 8 mm. to 10.5 mm. Average of 26 caterpillars, 8.9 mm.

Mature Caterpillar.—The shape and colour are very much as before.

The head is almost colourless, but it may assume a very faint brown shade.

Dorsal bristles as before. The longest bristles are on the first thoracic and the anal segments. The egg-shaped processes and short bristles thickly clothe the surface, as in the preceding instar.

The white bands are more plainly marked in some specimens than in others, and on very close examination are seen to be made up in reality of four white lines very slightly separated by the green.

The thoracic shield is a diamond-shaped pit, as before, but in addition there is a curved crease-like extension on each side ; near each of the side angles of the pit is a tubercle bearing a fairly long slender tentacle-like process.

Length, 14.5 mm. to 16 mm. Average of 7 caterpillars, 15.14 mm.

Chrysalis.—Compact, fairly cylindrical, narrower cephalad ; rounded, bluntly-tapering caudad. Truncated in the dorso-cephalic plane. Mesothorax with a low median dorsal prominence. Cremasteric area circular, provided with numerous minute hooklets, the latter with two curved prongs.

The chrysalis, except over wing, tongue, leg and eye-cases, is entirely covered with minute processes. Under magnification (55 diam.) these are seen to be wine-glass-shaped, the rims made up of tiny finger-like projections extending upwards and outwards in a circle. I could discover no hairs on the surface of the chrysalis, these processes evidently replacing them.

The colour is very variable, hardly any two alike ; often some shade of green (nile, blue, pale or merely tinged), or over the green on wing-cases and dorsum there may be a slight sprinkling of black or brown atoms, which may increase until the whole chrysalis is well covered with atoms and blotches, or the green may be lacking, and the colour then is black or brown (Roman sepia), or even as in one case, a purple-madder. The substigmatal and the two lateral, wavy, white bands of the caterpillar can sometimes be traced in the chrysalis, varying in colour, of course, sometimes white (particularly with the green forms), again as rows of black or brown specks.

The spiracles are white, with a faint yellowish tinge ; thoracic elongate-oval, abdominal oval.

Length, 8.5 mm. to 10.25 mm. Greatest width about 4 mm. at tips of wing-cases.

THE CHALCIDOID PARASITES OF THE COCCID *KERMES*
PUBESCENS BOGUE, WITH DESCRIPTIONS OF TWO
NEW GENERA AND THREE NEW SPECIES OF
ENCYRTINÆ FROM ILLINOIS.

BY A. A. GIRAULT, URBANA, ILL.

From a single small lot of specimens of this common coccid of the oak—*Kermes pubescens* Bogue—gathered from the twigs of a single tree on the campus of the University of Illinois at Urbana, during the summer of 1908, the following chalcidoid parasites were reared, several of which appear to be undescribed. The oak was a species of the *alba* group. So far, I believe, but a single parasite of this coccid has been recorded in the literature ; this paper adds at least three others, two representing new genera, and all belonging to a single subfamily, the Encyrtinæ.

May, 1911

Associated with the three encyrtinines reared here in Illinois, however, were found certain chalcidoids of the family Pteromalidæ, tribe Pachyneurini, genus *Pachyneuron* Walker, and of the family Eulophidæ, subfamily Tetrastichinæ, genus *Gyrolasia* Foerster, which are perhaps secondary in their relations, or may have come from some syrphid larva in among the hosts. The first was *Pachyneuron micans* Howard, and the second an apparently undescribed species of the eulophid genus mentioned (but without long marginal fringes of the fore wings), allied with (*Syntomosphyrum*) *Gyrolasia esurus* (Riley), differing from that species in having more slender veins in the fore wings. For the present it is left undescribed. These two species are not listed below (Accession Nos. 44,226 and 44,227, Illinois State Laboratory of Natural History, Urbana, Illinois, two males, one female and two females respectively, all on tags, and a slide for each species).

For the authoritative identification of the host I am indebted to Professor T. D. A. Cockerell, University of Colorado, Boulder, Colorado.

Family ENCYRTIDÆ.

Subfamily ENCYRTINÆ.

Tribe *Ectiromini*.

Cristatithorax, genus novum.

Normal position.

Female.—Head lenticular, not quite as wide as the thorax at its widest point, the facial impression rather small, not prominent, its caudal margin acute, yet not sharply defined by an arched carina, the convexed discal portion with moderately large, scattered punctures, bearing setæ; scrobes short, forming a semicircle; face between the eyes and the vertex hexagonally sculptured or rugose, the eyes margined with a row of moderately large punctures, each puncture giving origin to a single grayish seta; impression of the face from cephalic aspect (natural position) elliptical, less than one-half the length of the head; face beneath the eyes glabrous; vertex rather narrow, the eyes somewhat convergent above, the lateral ocelli touching the eye margin, the ocelli in an acute-angled triangle; cheeks finely rugose; antennæ inserted at the clypeal border, compressed, clavate, with no sharp demarkation between the funicle and club, the flagellum gradually enlarging, the scape slightly dilated towards apex, the funicle 6-jointed, longer than the club, and with the first joint shorter than the pedicel; mesothorax finely reticulated, with a squammose appearance,

the scutum with some large punctures, which are scattered and inconspicuous, and clothed with short stiff prostrate gray or silvery hairs, which, however, are absent at the meson of the caudal three-fourths of the sclerite and along the caudal margin, some distance laterad from the meson; scutum and scutellum subequal in length, the latter slightly longer; axillæ cuneate, joining at base of scutellum; scutellum with a conspicuous tuft of black hairs at its dorsal apex. Abdomen conic-cylindric, equal to combined length of head and thorax, the hypopygium prominent, extending one-fifth the length of the abdomen beyond the anal extremity. Wings infuscated beyond the submarginal vein, with the extreme apex hyaline however; marginal vein slightly thickened, linear, thrice the length of the stigmal vein, which is nearly twice the length of the postmarginal vein, the latter distinct; a short V-shaped, hyaline, hairless marking present, its apex along the costal margin just beyond the postmarginal vein, one branch running slightly apico-caudad (normal position) across the truncate end of the stigmal vein, the other proximo-caudad, into the angle subtended by the junction of the stigmal and postmarginal veins; also an oblique (meso- or proximo-caudad) hairless line running from the stigma, but included within the coloured area of the fore wing, and hence somewhat obscured. Marginal cell of hind wings long. Wings extending beyond abdomen, and slightly beyond the hypopygium. Legs normal. Mandibles bidentate, the outer tooth shorter, obtuse, and one-third as broad as the inner, which is broadly truncate at apex.

Nearest to *Chrysopophagus* Ashmead, and separated from it by the slightly dilated scape, the longer pedicel, the less noticeable compression of the antennæ, and the differently shaped, more rounded head, and by mandibular characters, the mandibles in *Chrysopophagus* being distinctly 3-dentate, the two inner (mesal) teeth being equal and slightly smaller than the outer (lateral) one, and less acute. And liable to be confused with *Habrolepis* Foerster and *Eusemion* Dahlbom, of the tribe Mirini.

(Type: *C. pulcher*, species nova, described in following.)

1. *Cristatithorax pulcher*, species nova.

Normal position.

Female.—Length, 1.35 mm. Moderate for the tribe. Submetallic; varicoloured. General colour dark chrome-yellow. Cheeks bordering the eyes, face below the eyes, and a portion of the convex disk of the facial impression, mesoscutum, dorsum of the metathorax, the whole of the abdomen, excepting base of venter and the exerted portion of the hypopygium, which is white, caudal portions of the thoracic pleurum, dark

purplish, with a metallic lustre, especially at the dorsum of the abdomen. Eyes dark, prominent; ocelli ruby red, with some yellow.

Antennæ black, the middle or intermediate longitudinal portion of the sides of the scape silvery white, the white stripe reaching the margin at apex, at the dilation. Head, prothorax, scutellum, ventral base of abdomen, thoracic pleuræ and venter dark chrome-yellow, the axillæ still darker, the vertex and face with some traces of a purplish sheen. Legs dark yellowish, with some purplish above, the intermediate femora with a white annulus near the apex; tarsi yellowish, the posterior pair white, with two apical joints dusky. Distal two-thirds of the wing fuliginous, the extreme apex and the basal third hyaline; in reflected light wings purple; sooty colour more pronounced in a small triangular area between the indistinct oblique hairless line and the marginal vein, and less so in the portion of the wing included between the marginal vein and the posterior margin; a somewhat irregular longitudinal lighter area in the middle of the wing, near the posterior margin. Hind wings hyaline.

Antennæ 11-jointed; scape longer than the combined lengths of the pedicel and first two funicle joints; pedicel obconic, longer than the funicle joint 1; funicle gradually, regularly enlarging to club; funicle joints 1 and 2 subequal, 1 slightly narrower and longer; funicle joints 3 and 4 subequal, larger, 4 somewhat larger than 3; joints 4 and 5 of funicle subequal, 4 slightly smaller, both still larger than 3 and 4, and wider than long; club joints slightly wider than joints 5 and 6 of funicle, the basal joint subquadrate, the two apical joints narrow, much wider than long.

(From two specimens, two-thirds-inch objective, two-inch optic. Bausch and Lomb.)

Male.—Unknown.

This species is superficially like *Chrysopophagus compressicornis* Ashmead. Described from two tag-mounted females reared from *Kermes pubescens* Bogue, on oak, Urbana, Illinois, July 1, 1908.

Type: Accession No. 37,590, Illinois State Laboratory of Natural History, Urbana, Illinois, one female, tag mounted; head and antenna (1 slide) and antenna (1 slide), both in xylol-balsam.

Tribe *Mirini*.

Ænasioidea, genus novum.

Normal position.

Female.—Length moderate for the tribe.

Head (cephalic aspect) rounded triangular, longer than wide, not lenticular, the facial impression weak, bounded by the antennal scrobes which form a rounded triangular impression, surrounding on two sides the raised cuneate disk of the facial impression; the apex of the scrobes obtuse, reaching to a point midway between the eyes (cephalic aspect); the whole of the cephalic aspect of the head and the vertex closely, but not very coarsely, punctured, the surface slightly less rough than the eye surface; ocelli in an almost equilateral triangle, the lateral ones slightly farther apart from each other than each is from the cephalic ocellus, and close to, but not touching, the eye margin, and still farther from the occipital margin; eyes large, round, prominent on the dorso-lateral aspect of the vertex, and prominent from both dorsal and cephalic aspects, somewhat convergent from dorsal aspect, and from lateral aspect not as long as the cheeks or malar space, regularly convex, lenticular, and reaching caudad to the convexed, acute occipital margin; from dorsal aspect vertex an inclined plane; the occipital foraminal depression almost acutely concave; face with some sparse grayish hairs; antennæ inserted far below the middle of the face, the scape with a large leaf-like dilation ventrad, the pedicel longer than the first funicle joint, the funicle 6-jointed, white, annulate with black at the first joint, cylindrical and slightly clavate, the club 3-jointed, white, ovate and distinctly wider than the funicle, but not more than one-half as long; flagellum on the whole cylindrical, subcapitate. Dorsal aspect of the surface of the thorax similar in sculpture to that of the head, the pro- and mesonotum with scattered, short, stiff, recumbent white hairs, hispid (Coddington lens, half-inch), the hairs apparently not arising from shallow, larger punctures; axillæ meeting at the meson, cuneate; along the median line scutellum somewhat longer than the mesoscutum, peltate, its cephalic margins oblique from the side to the meson, cephalo-mesad; caudal margin of the mesoscutum straight or very slightly convex; dorso-lateral aspect of the mesopostscutellum and the metanotum bare, that of the former finely, obliquely corrugated.

Abdomen short, only about two-thirds the length of the thorax, ovate, its dorsum concave and not clothed with stiff pubescence, the spiracle of the third segment dorsal, at the lateral margin prominent, fuscous, margined and guarded by about three long black setæ; hypopygium prominent, plowshare-shaped, extending distinctly beyond the abdomen. Legs normal, the middle tibial spur short and stout, not as long as the basal tarsal joint, which is by far the longest of the joints of the intermediate tarsi, the others relatively small; the bristles on the intermediate

tarsi ventrad, short, more numerous and stiffer than usual ; the proximal tarsal joint of the caudal legs intermediate in size between those of the cephalic and intermediate legs, but all of the proximal tarsal joints longer than the other tarsal joints, excepting perhaps that of the cephalic legs, the apical tarsal joint next in length, the three others nearly subequal in length and shorter ; caudal tibiæ with but a single short spur, the single spur of the cephalic tibiæ curved and slender, reaching nearly to the apex of the proximal tarsal joint.

Wings hyaline, both densely, closely ciliate in the disk, and the fore wings with a transverse, oblique, hairless streak, as in *Anagyrus* Howard, extending from the stigmal vein, proximo-caudad ; marginal vein of fore wing punctiform, the postmarginal vein absent, the stigmal vein moderately long, straight, the submarginal vein long and slender, about five times the length of the stigmal vein, but not reaching to the middle of the costal margin. Costal cell of caudal wings extending to the hooklets. Wings relatively long. Body non-metallic, pallid ochraceous.

Mandibles 3-dentate, the outer (lateral) tooth shorter than the two inner (mesal) ones and obtuse, the two inner shallow and subequal, as if formed of a broad truncate tooth, with a concave emargination at the centre of its apical margin.

(*Type: A. latiscapus*, species nova, described beyond.)

Close to *Enasius* Walker, but differing in the smaller club, the antennæ being capitate, in the longer funicle, the absence of large thimble-like depressions on the head, and the different shape of the latter, the joined axillæ, in the absence of the postmarginal vein, the hyaline wings, and in the broader pronotum and longer mesoscutum. And agreeing in some respects with *Encyrtus* Ashmead in wing and antennal characters, but the scape of the antennæ is totally different, and the body non-metallic, besides differing in habitus. The genus is liable to confusion with *Anagyrus* Howard, of the tribe *Ectromini*, but besides the 3-dentate mandibles and other tribal characters, the more reduced venation will readily distinguish it.

2. *Enasioidea latiscapus*, species nova.

Normal position.

Female.—Length, 0.89 mm. General colour pallid yellowish, the head and mesonotum conspicuously light chrome-orange, the dorsal aspect of the mesopostscutellum and the metanotum, also the proximal segment of the abdomen, blackish, the pronotum dark, with a pruinose appearance, but pallid laterad ; remainder of abdomen yellowish white; eyes very dark

reddish, margined dorsad, along the occipital margin, with yellowish; ocelli ruby-red, with some yellow; tegulæ pallid. Antennæ white, the dilation or exfoliation (only) of the scape, the base of the pedicel dorsad, and the first funicle joint black. Venation pallid yellowish. Legs white, with a tinge of yellowish, the apical tarsal joint darkened.

Mesopleurum slightly reticulated. Marginal cilia of fore wings short, those of the caudal margin of the caudal wings longer; stigmal vein capitate; area of the fore wing proximad of the oblique hairless line or streak densely ciliate, as in the larger portion of the wing apicad of the streak, excepting at the caudal margin, proximad; the oblique hairless streak does not extend quite to the caudal wing margin, and is broadest at its caudo-proximal end; spurious veins inconspicuous, not breaking the ciliation of the wing. Tegulæ longitudinally rugulose.

Scape as long as the pedicel, and the first three funicle joints combined; pedicel obconic, not quite twice as long as it is wide at apex, nearly as long as the combined length of the first two funicle joints, which are subequal and shortest of the antennal joints, and narrower than the apex of the pedicel; funicle gradually widening to the club; funicle joint 3 longest of the funicle joints, slightly shorter than the pedicel, wider than joint 2 and narrower than joint 4 of the funicle; the latter still longer than wide, shorter than the preceding joint but wider; funicle joints 5 and 6 subquadrate, shorter than joint 4, and distinctly narrower than the proximal club joint. Basal joint of the club longest of the three, the intermediate joint shorter but widest, and the apical joint shortest and narrowest, obtusely conical. Antennæ pubescent.

(From six specimens, two-thirds-inch objective, two-inch optic. Bausch and Lomb.)

Male.—Unknown.

Described from two tag-mounted and four slide-mounted females reared June 25th, 1908, from specimens of *Kermes pubescens* Bogue, on oak, Urbana, Illinois. Seven females reared.

Type: Accession No. 40,285, Illinois State Laboratory of Natural History, Urbana, Illinois, two females tag-mounted and four females in xylol-balsam (two slides).

Microterys Thomson.

3. *Microterys cincticornis* Ashmead.

Ashmead, 1900, p. 390. (Proc. U. S. National Mus., Washington, D. C., XXII.)

King, 1899, p. 139. (CANADIAN ENTOMOLOGIST, London, Ontario, XXXI.)

"2. *Microterys cincticornis* Ashmead, new species.

"This species probably represents a variety of the European *M. tessellatus* Dalman. It agrees with it in stature and in wing markings, except that the triangular white marginal spots are connected so as to form an additional band, while the head and thorax at sides, too, are quite differently coloured. The head, the pronotum, except above, the sides of the thorax and the legs are brownish-yellow, while the mesonotum is metallic-blue.

"*Type*: Cat. No. 4769, U. S. N. M.. (Ashmead collection).

"*Habitat*: New Hampshire: Mount Washington. (Mrs. A. T. Slosson)."

George B. King, in 1899, recorded this parasite from *K. pubescens* in Massachusetts. I have not met with it in Illinois. Through the kindness of Mr. J. C. Crawford, Division of Insects, U. S. National Museum, Washington, D. C., I am able to offer the following descriptive notes on this species, taken from the type and in comparison with the two co-type females of *M. speciosissimus*, species nova, described just beyond: "*cincticornis* has the upper part of the head more reddish, the middle more yellowish; this yellowish colour shows on the back of the head and on the under parts of the insect; the scape is light—only the anterior margin is dark; the scutellum is very metallic—as much so as the mesonotum; legs all light; what I will call the middle band on the wing is dark and the apical band distinct, making the apical part of the wing darker than in your species; in your species the middle band is a series of dark spots, but in Ashmead's species these are so close together that they are hardly distinct from one another, being a band instead." (J. C. Crawford, *In litt.*, January 8, 1909.)

In *cincticornis* there is no tuft of hairs on the scutellum.

4. *Microterys speciosissimus*, species nova.

Normal position.

Female.—Length, 1.33 mm. Normal in size and shape; funicle annulate, scape greatly dilated, scutellum without a tuft of hairs at apex.

General colour ochraceous, the mesoscutum metallic dark blue, the axillæ and scutellum duller than the mesoscutum, purplish, the dorsum of the abdomen the same colour as the scutellum, with a little more blue, the abdominal venter concolorous with the dorsum of abdomen, the cephalic and caudal margins of the pronotum nearly concolorous with the mesoscutum, leaving a narrow transverse intermediate portion ochraceous,

but which, however, widens at the lateral third, extending cephalad, laterad and caudad to the respective margins; metanotum concolorous with the scutellum, excepting dorso-laterally, where it is ochraceous; tegulae ochraceous, obscured in the disk with some bluish; clypeus conspicuously dark brown, from side to side; head between the vertex and front, between the eyes, variable, frequently tinged with lustrous purple, visible in certain lights only; legs ochraceous, the caudal femora and tibiae, however, flushed with bluish, the intermediate tibiae more delicately so, the apical tarsal joint dark; antennae black, the 5th and 6th funicle joints white; scape at the peduncle and extreme apex ochraceous, and the pedicel and first two funicle joints dusky, lighter ventrad; dilatation of the scape somewhat metallic and with some bluish. Fore wings fuliginous to end of the stigmal vein, the apical margin of the fuliginous area convex; from thence apicad, hyaline, but through the midst of this, nearer the fuliginous area than to the apex of the wing, runs transversely (cephalo-caudad) a broken band of fuliginous, consisting of four distinct portions, two subequal subquadrate spots leading caudo-apicad from the cephalic wing margin, a smaller rounder dot in the middle of the wing, further proximad, and then leading to the caudal margin, apico-caudad, a longer columnar area; if joined together the line formed would be Σ -shaped; venation brownish-black. Eyes dark; ocelli ruby-red.

Head slightly wider than long (cephalic aspect), sublenticular, as wide as the thorax at its widest point, from lateral apex deflexed, the facial impression normal and margined caudad, the scrobes forming a semicircle, the mesal portion of the impression carinated for a short distance along the median line near the caudal margin. Face between the eyes and the vertex as in *Cristatithorax pulcher* Girault. Eyes nearly circular, their mesal margin somewhat flattened, rather large and on the cephalo-lateral aspect of the head, their caudal margins invading the sharp occipital margin; ocelli not near the occipital margin, in a nearly equilateral triangle, the lateral ones oval and nearly touching the eye margins, and slightly nearer to each other than either is to the cephalic ocellus, which is circular. Occipital margin acute, convex. Pro- and mesonotum and the mesopleurum squammose, the two former with regularly scattered, obscure punctures, which are less conspicuous on the scutellum and axillae, each puncture giving origin to a reclinate, short, dull grayish seta; meso-scutum slightly shorter than the scutellum along the meson, its caudal margin regularly convex; axillae acutely cuneate, meeting at the meson, where they are subaccuminate; scutellum peltate, normal, without a tuft

of bristles, its cephalic margin angularly convex, subacute at the meson. Metanotum normal. Abdomen short and stout, subtriangular, not quite as long as the thorax, flat dorsad and not pubescent, shining, but with the squammose sculpture of the thorax, which, however, is more delicate on the abdomen. Sheaths of the ovipositor slightly exerted, ochraceous. Fore and hind wings densely ciliate in the disk; marginal vein of the fore wing short and thick, but slightly longer than wide, the stigmal vein nearly as long as the marginal and postmarginal veins combined; the latter slightly shorter than the marginal vein; fore wings extending for nearly one-half their length beyond the abdomen; a subcuneate hairless line with its apex just caudad of the stigmal vein runs from that vein cauda-proximad through the fuliginous area to the caudal wing margin, where it is widest; this hairless line is not conspicuous; joining it, or originating from it, near the caudal margin, is a narrow, curved white line, which runs apicad through the fuliginous area to its apical margin, where it splits into two; also, this line is not very conspicuous. There is also in the fore wing an inconspicuous, more deeply-coloured spot beneath the submarginal vein, just proximad of the oblique hairless line, and running somewhat parallel to it. Immediate base of fore wing naked.

Antennæ 11-jointed, inserted at the clypeal border; scape with a conspicuous, dorso-ventral, leaf-like dilatation or expansion, the dilatation appearing just beyond a short peduncle and extending to the apex, and of itself hemi-pyriform; scape longer than pedicel and joints 1 and 2 of funicle combined, the expansion with some punctures; flagellum normal, cylindrical and regularly clavate, and the club normal. Pedicel obconical, longer than any of the following joints, and slightly shorter than the combined lengths of joints 1 and 2 of the funicle; first funicle joint two-thirds the length of the pedicel, and slightly shorter and narrower than funicle joint 2; funicle joints 2 and 3 subequal, joint 3 slightly thicker, both longer than joint 1, and still more so than the three following joints; joints 4, 5, 6 of the funicle quadrate, subequal, one-third shorter and wider than joint 3; the club regularly conical, about the same length as the combined lengths of joints 4, 5 and 6 of the funicle, its basal joint one-third longer and slightly wider than funicle joint 6, and as long as, and much wider than, funicle joint 3; the intermediate joint is one-third shorter and slightly narrower than the basal joint, and narrows cephalad; the apical joint of the club conic, equal in length to the basal joint. Antennæ hispid.

Mandibles 3-dentate, the two inner (mesal) teeth, however, shallow, equal, and taken together like a single broad tooth notched at the centre of its apical margin; the outer (lateral) tooth acute, but very slightly longer.

(From eight specimens, two-thirds-inch objector, two-inch optic. Bausch and Lomb.)

Male.—Unknown.

This beautiful species was described from eight females reared June 23 (seven ♀s) and July 7th, 1908 (one ♀) from the same lot of *Kermes pubescens* Bogue.

Types: Accession Nos. 37,561 (five ♀s, tag-mounted) and 37,593 (♀ head and antenna, one slide, xylol-balsam), Illinois State Laboratory of Natural History, Urbana, Illinois. *Co-type*: No. 12,166, United States National Museum, Washington, D. C., two ♀s, tag-mounted.

A NEW ALASKAN MOSQUITO.

BY C. S. LUDLOW,

Army Medical Museum, Washington, D. C.

For several years there appeared in the collections of mosquitoes from Alaska what were evidently two distinct species, but in such bad condition that it was impossible to be sure just what the differences were. Now, after some four years of indcision, specimens have been received that allow of differentiation and description, and I give below the description of what seems to be a new species:

Culex borealis, n. sp.

Female.—Head very dark brown, covered with broad, curved ochraceous scales in a comparatively narrow median space from vertex to occiput, broad, flat ochraceous scales laterad and extending as lateral scales, a few fork scales, light and dark, at the nape; brown bristles projecting forward over and between the eyes; antennæ brown, verticels brown, pubescence light, basal joint testaceous, with flat pale ochraceous scales on the median aspect; palpi dark brown, with a very few light scales, mostly on the ventral side; proboscis very long (about seven times longer than the palpi), almost black; eyes reddish-brown; clypeus dark, and in some specimens the contiguous mouth-parts much distended, rather pouch-like on the ventral side.

Thorax: Prothoracic lobes dark, with pale ochraceous flat scales; mesothorax very dark, covered with large curved scales, a narrow median

May, 1911

line of ochraceous scales with a very broad stripe of black ones on each side, extending from the nape to the "bare space," bordered laterally by ochraceous and black scales mixed, ochraceous scales predominating to the lateral margin of the mesothorax; near laterad of the "bare space" is often a short dark stripe, extending only a little way cephalad from the caudad margin of the mesonotum, but in some specimens this is lacking, or nearly so; scutellum covered with ochraceous broad curved scales; metanotum very dark; pleura very dark, mostly covered with flat pale ochraceous scales.

Abdomen covered with almost black scales and basal pale ochraceous bands, which vary greatly, being usually broad, somewhat widened laterally as "lateral spots," but sometimes these basal bands are narrow; the first segment has pale scales apically and mostly in the median portion, and sometimes the apical segment is mostly light-scaled; venter mostly with pale ochraceous scales, sometimes showing apical black bands, very narrow on the median part, broader laterally.

Legs: Coxæ and trochanters mostly light-scaled; femora all pale basally and ventrally, dorsally darker toward the apex, but speckled with ochraceous scales, light knee spot; tibiæ dark, but some light scales sprinkled through; 1st and 2nd tarsals also slightly speckled with ochraceous scales, the remainder of the legs usually entirely dark-scaled; ungues heavy, uniserrate.

Wings clear, brown-scaled, except at the very base, where the subcosta, at least, has, on many specimens, bright ochraceous scales. Cells large; 1st submarginal a little longer than 2nd posterior, and about $\frac{1}{3}$ longer than its petiole, the bases nearly on a line; root of the 3rd longitudinal vein about as long as the mid cross-vein which it meets nearly in a straight line; posterior cross-vein about the same length as the mid and its own length distant.

Length, 10 mm., of which 3.5 is proboscis.

Habitat.—Alaska. Taken June, July, August.

The dark submedian thoracic stripes are nearly black, and do not suggest in any way the brown markings of *Currei*, *latavittata* or *pretans* nor do they resemble the brown stripes of Felt's *absobrinus*, of which Dr. Felt kindly sent me specimens for comparison, and it seems likely it is a new species. It occurs in great numbers, sometimes with an apparently closely-related species, which, however, lacks thoracic markings, and is most likely *nigripes* (or *impiger*). So far this new species has never been sent in with *T. alaskaensis* Mihi, which has apparently a much more restricted distribution.

BOOK NOTICE.

"THE CODLING MOTH": L. Cæsar. Bulletin 187, Ontario Department of Agriculture. 40 pp., 21 figs. (Toronto, Ont., Jan., 1911.)

To say that this publication "fills a long felt want," if it has the disadvantage of echoing the words of hurriedly written notices and reviews of books, is only expressing our firm conviction. Every entomologist in Eastern Canada, we say "eastern" advisedly, has realized the need of a clearly written and practical bulletin on this insect, which is, of all insects attacking the apple, the most universally destructive. It has remained, however, for Mr. Cæsar to endeavour to supply that need, and he is to be congratulated on the successful manner in which he has accomplished his task. He has added to the increasing list of valuable publications written by members of the staff of the Ontario Agricultural College one which is second to no other in its manner of treatment, simplicity of expression, so important in these bulletins of an educational character, and in the description of the practical methods of control.

The account of the life-history of the moth, which succeeds the introduction, contains many original observations. These, together with the observations of other investigators, increase the utility of the bulletin to no small extent, as so many accounts are mere compilations, and inapplicable to local conditions, which must, of necessity, be studied. The author's experience of orchard conditions in Ontario, and his intimate acquaintance with the practical work of spraying, give the bulletin the impress of authority and a markedly increased value. We are pleased to note his insistence on thorough spraying. In view of the debated question as to the efficacy of the single-spraying for controlling the Codling Moth, the author's experience, in which this method resulted in an average of 90 per cent. worm-free fruit, is worthy of note. As we presume the author is not responsible for the inversion of Figure 4, we will not criticize the only one of twenty-one excellent illustrations to which reference might be made.

We hope that the free distribution of the bulletin by the Department of Agriculture for Ontario will result in a marked increase in the practice of judicious and thorough spraying, the beneficial effect of which will be incalculable.

C. G. H.

Mailed May 12th, 1911.

The Canadian Entomologist.

VOL. XLIII.

LONDON, JUNE, 1911.

No. 6

ON THE NOMENCLATURE OF THE MALE GENITALIA IN LEPIDOPTERA.

BY J. MCDONNOUGH, PH. D., DECATUR, ILL.

The genitalia in Lepidoptera have, within the last ten years, become one of the most important factors in systematic work, and no revision of any group can be considered complete which does not deal with the subject of the sexual armature, serving as it does in many cases to separate species otherwise difficult to distinguish. This being the case, it is all the more to be regretted that already at this comparatively early date in the history of the subject the terminology has become so involved. The female armature, owing to its comparative simplicity, and possibly to the fact that it has not been so carefully studied as that of the male, has suffered little in this respect, but in reviewing the literature on the male genitalia we are at once met by a hopeless jumble of terms, which to say the least of it neither tends to elucidate an already difficult subject, nor to awaken a growing interest in the average collector for this particular branch of his hobby. As a case in point, and one that gave the prime motive power for this present paper, we might cite the following: Prof. J. B. Smith, in his various publications on North American Noctuidæ, uses the term "*harpe*" for the two outermost lateral valve-like appendages of the male, applying the term "*clasper*" to a portion of the inner armature of this same harpe, usually in the form of a curved hook or rod arising from the mid-ventral surface. In this he has been followed by various American authors, and also by Pierce, who in the introduction to his valuable work on the Genitalia of British Noctuids, has attempted to define the various parts. If, on the other hand, we turn to Rothschild and Jordan's Monograph of the Sphingidæ, we find these same terms used in exactly an inverse sense; the outermost appendages are termed "*claspers*," whilst for the inner armature the term "*harpe*" is employed. Obviously only one of the learned authors can be correct in his use of the above terms, and prompted partly by curiosity, partly by a thirst for knowledge, we have delved somewhat deeply into the bibliography of the subject. In the following paper we have endeavoured to fix and apply the correct names

to the various parts of the ♂ genitalia as determined strictly by the law of priority ; we can promise nothing startlingly new, but consider the lack of a uniform terminology sufficient warrant for thus obtruding ourselves upon the public notice.

The older writers, such as Burmeister, Kirby and Spence, and Siebold and Stannius, dismiss the subject of the ♂ genitalia of Lepidoptera in a few words. All the above authors use the term *valvæ* or *valves* for the two lateral outer appendages. Just who originated the term we have not been able to discover, but it dates back before 1815. Mention of further portions of the genital armature is first made by *De Haan* in 1842. This author has examined the genitalia of several exotic Papilios ; he uses the term valves (kleppen) in the sense of the older writers, and makes further mention of two inner lateral appendages (zijdelingsche aanhangsels), and a blunt-pointed spine with two lateral plates at the extremity of the abdomen ; he, however, applies no particular terms to these parts.

The first work of importance after this date dealing with ♂ genitalia is that of Scudder and Burgess in 1870. Here we meet with the term *clasp* employed instead of *valve*; a reference to the figures leaves no doubt that the two terms are identical. A "short, frequently bent or curving process, ordinarily somewhat triangular in shape, and very often armed with spinules," which arises from the basal portion of the lower half of the clasps (in the genus under discussion, Nisoniades, each clasp is divided into an upper and lower portion), is termed "*basal process*." The dorsal portion of the armature is simply referred to as the "*upper organ*."

In 1876 Buchanan-White issued a profusely illustrated monograph on the ♂ genital armature in the European Rhopalocera. Owing to the poor technical methods employed, the hair being simply removed from the anal segments, and the portions thus exposed delineated, little reliance can be placed on the figures. The author employs the term "*Harpago*" for the lateral valve, and designates the dorsal portion—the *upper organ* of Scudder and Burgess—by the name of *Tegumen*.

This work was followed in 1882 by a monograph of the clasping organs of the genus Papilio by Ph. H. Gosse. Besides a review of the existing literature, the author gives for the first time fairly exact definitions of the various portions of the genitalia. The term *Valves* is again employed for "two broad plates, which by free-working joints are united to the overlapping edges of the eighth abdominal segment. They are clothed on the exterior with scales like those of the body. Their direction

follows the general plane of the sides of the abdomen." Under the heading *Harpes* we find the following: "The interior surface of each valve, which, as I have said, is hollow, is the seat of a peculiar organ, which appears to take a very prominent part in the prehensile function. . . . Within the hollow lies a plate of what I presume to be pure chitine, usually as transparent as glass, but tinged with a yellow-brown hue, thickening at various parts, especially at its margins and irregular ridges. . . . The parts thus thickened are also elevated, not merely in the bounding walls and ridges that I have mentioned, but in general by the separating of a portion of the organ from the cavity-floor; so that this particular part shall be elevated and projected freely into the inclosed space between the valves. And these projected portions either take the forms of curved acute spines, or, more frequently still, are notched into sharp teeth standing in serried rows. . . . Whatever the form, the base is always expanded, often with ridges, spreading over the basal edge of the valve. I have no hesitation in assigning a distinctive epithet to the organ in question; and it is known throughout this memoir by the term *Harpe*."

In a footnote, the correctness of which we will comment upon later, Gosse says: "Dr. White has used the term *harpago* for the organ which, in the other Rhopalocera appears to represent the *valve* and *harpe* united. But in the Papilionidæ, where these are separate, it is desirable that they should receive separate designations. The terms *harpago* and *harpe* are sufficiently distinct; while they bear a relation to each other not unlike that of the things designated."

The term *Uncus* is used for the hook-like tip at the dorsal extremity of the abdomen, the *tegumen* of Buchanan-White being restricted to the broad basal portion. We further meet with the term *Scaphium* for the first time, this being applied to a "mass of shining white tissue, apparently in organic union with the lower surface of the uncus near its origin," and shaped like a lower jaw or the keel of a boat. Following this various articles by Cholodkowsky, Hoffman, Jackson, Backer, Escherich, Peytoureau, Stichel, Klinkhardt and Poljanec have appeared from time to time. Backer first applied the term *Saccus* to the chitinous process projecting into the abdomen from the anterior margin of the xii segment, a process already observed by Cholodkowsky. Most of these authors deal largely with the ontogenetic development of the genital organs, attempting to bring the results of their investigations in this branch of the

subject into some sort of relation with the morphological details. Owing to the wrong conclusions and the false application of terms, the general result of these works is still very unsatisfactory, and not until 1902, when *Enoch Zander* issued his excellent and most thorough treatise on the male genital organs of Lepidoptera, do we arrive at any clear and definite idea of the development of these organs, and the relationship of the various parts to each other.

We will have to confine ourselves here to a short statement of the various conclusions reached by Zander, but would heartily recommend anyone intending to occupy himself with this subject to study the work itself in detail.

In spite of the great and confusing variety of forms Zander has satisfactorily shown that the male genitalia may be traced to a single

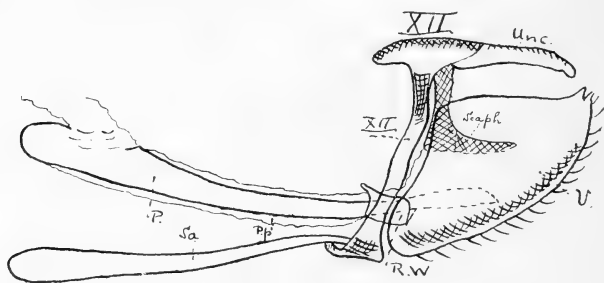


FIG. 8.—Genitalia of *Apatura iris*, side view (according to Zander), 14: 1. P., Penis; Pp., Penis pouch; R. W., Ringwall; Sa., Saccus; Unc., Uncus; Scaph., Scaphium; V., Valve.

common plan of construction. The abdomen of *all* Lepidoptera consists of 10 segments, representing the body segments iv–xiii. The *Segmental rings* of segments v–ix consist of a dorsal and ventral chitinous plate, the tergite and sternite respectively; in segment iv the sternite is always lacking. Segments x and xi, while often agreeing exactly with the preceding ones, are sometimes slightly modified and brought into relationship to the genital organs. In certain Geometridæ Seg. x has large hair pencils concealed in lateral pockets (Haartaschen of Poljanec); Seg. xi shows in several neotropical butterflies several enormous lateral processes arising from the posterior portion of the sternite (Rami of Stichel); several species of Bombycidæ show also an armature of chitinous hooks and processes.

The xii and xiii segments are always greatly modified and intimately connected with the sexual system. The chitinous covering of the xii segment is much thicker than in the preceding ones, and forms a closed ring about the body. In the lowest families (Micropteryginæ) this ring is of equal breadth all round, but in the majority of the remaining families the dorsal portion is much more broadly developed than the ventral and lateral portions, the whole bearing a striking resemblance to a signet ring. In many cases, examples of which can be found in every group with the exception of the Rhopalocera, a lateral joint is present, dividing the ring into a ventral and dorsal portion.

To the median ventral portion of the wing is attached the *Saccus*, a secondary invagination of the intersegmental membrane, which projects as a strongly chitinized pocket more or less deeply into the abdomen. In several species of *Bombycidae* considerable modification of the *Saccus* has taken place, leading in extreme cases to the formation of a large chitinous sac beneath the sexual organs (*Bombyx rubi*). In but few instances is the *Saccus* completely lacking.

The conical anal segment (xiii) is scarcely visible in the majority of cases in the fully developed organ. The *Uncus* and *Scaphium*, which

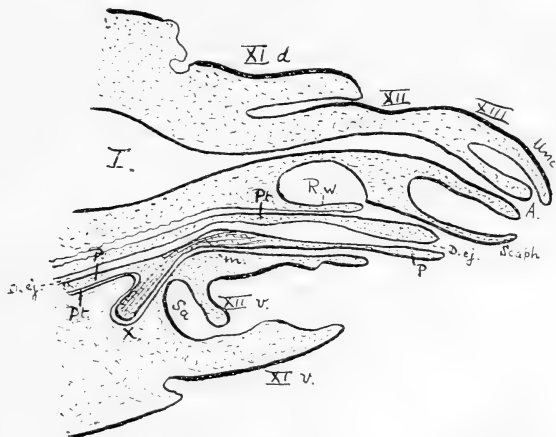


FIG. 9.—Median section through anal portion of pupa of *Parapoynx stratiotaria* in advanced stage of development (according to Zander), 40:1. I., Intestine; A., Anus; d., Dorsal plate; v., Ventral plate; D. ej., Ductus ejaculatorius; m., Musc. retract. Duct. ejac; P., Penis; P. t., Penis pouch; R. W., Ringwall; Sa., Saccus; Scaph., Scaphium; Unc., Uncus; X, Blind pouch; XI-XIII, Segments.

for long were considered as the dorsal and ventral portions of this segment, prove on examination of pupal stages to be but secondary processes. The true segment wall remains mostly membraneous, and is usually concealed within the xii segment. Sometimes, however, the anal cone projects, and in such cases the secondary processes are usually absent, and either the dorsal portion (*Heliothis*, *Catocala*), or the ventral (*Hadena*, *Nonagria*) is more strongly chitinized. The *Uncus* usually has the form of a single ventrally-inclined hook, but may be bifid or even replaced by several processes or hooks. The *Scaphium* shows a similar degree of variation, and is often lacking in *Rhopalocera*, *Noctuidæ*, etc.

The *Valves* are enormously developed lateral appendages, which are always hinged to the postsegmental margin of the xii segment. Usually symmetrical, they show in several instances (*Nisoniades*, *Pterophoridae*) marked asymmetry, and are furnished on their inner concave side with all manner of hooks and bristles. They originate at a late larval period in the so-called genital pouch, an ektodermal invagination of the xii ventral membrane. At the bottom of this pouch two conical mounds undergo division, forming two lateral warts, the embryonic *Valves*, and two centrally placed ones, which afterwards unite to form the embryonic *Penis*.

During the pupation stage, owing to the disintegration of the genital pouch, the *Valves* come to lie on the surface, while the *Penis* remains at the base of a small secondary depression, the commencement of the so-called *Penis pouch* (*Penistasche*). The remaining development takes place during the pupal period. The *Penis pouch*, which is possibly identical with the *Penis sheath* of Poljanec, possesses generally, as seen from behind, a funnel-shaped appearance, narrowing to a fine tube, which enters the abdomen for a considerable distance. The narrowing may be gradual, but in most instances the transition is sudden, and at the point where the pouch enters the body a so-called *Ringwall* (*Penis-funnel* of Jordan) arises, a hollow cone-like structure, either strongly chitinized all round, thus forming a *Ring*, or else chitinized only ventrally, giving the appearance of a groove (*Sella* of Stichel). The outer wall may show a considerable armature of hooks, etc., which in some cases becomes quite complicated, leading Poljanec into the error of supposing that "*inner valves*" existed. (*Pygaera pigra*, *Psodos coracina*).

Closely fitted into the *Penis pouch* we find the *Penis* proper; the proximal portion is merely membranaceous, but the distal end projects out of the *Ringwall* as a strongly chitinized tube, which is of varying shape

and size, and often armed with hooks and crotchets. At the ventral base of this end-portion is usually found a chitinous sack, commonly and erroneously taken to be the blind end of the *Penis* itself, giving rise to the idea that the Ductus ejaculatorius entered the *Penis* from the dorsal side. As a matter of fact the *Penis* extends far beyond this point into the abdomen, the use of the sack being to contain the retractory muscle of the eversible Ductus ejaculatorius, which passes through the *Penis* for its entire length as a finely chitinized tube and may occasionally be observed projecting from the distal end in the form of a delicate membrane.

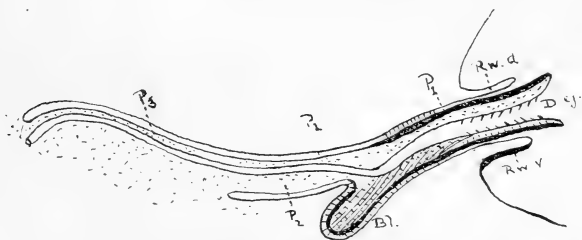


FIG. 10.—Section through Penis and Penis pouch (according to Zander). P₁, P₂, P₃, Penis; D. ej., Ductus ejaculatorius; R.w. d., Dorsal portion of Ringwall; R.w. v., Ventral portion of Ringwall; Bl., Blind pouch with musc. retract.

In this preface to "Genitalia of British Noctuidæ," issued in 1909, *Pierce* has devoted a short chapter to "Nomenclature and Descriptions." While we do not wish to depreciate the excellent work done by the author, we regret to find that his definitions are, in the light of what we have just stated, far from correct. As already noted, the term *Harpe* is applied by *Pierce* to the two outermost lateral appendages. Taking into consideration the ontogenetic development of these parts, as shown by *Zander*, and referring to the original definition of the term as given by *Gosse*, we inevitably come to the conclusion that *Pierce's* use of it is incorrect. He has either followed *Smith's* lead or has possibly confused it with the *harpago* of *Buchanan-White*, which, in its turn, must fail before the older terms *valve* or *clasp*. The *harpago* is not, as *Gosse* has stated, a fusion of *valve* and *harpe*, but rather a simple *valve* which is destitute of any inner armature in the shape of a *harpe*. The term *clasper*, as used by *Pierce* and by *J. B. Smith*, also cannot stand; *Scudder* has already employed the term for another portion, viz., the *valve*. The hook-like process arising from the central portion of the inner side of the

valve in the Noctuidæ, while perhaps not absolutely identical with the *Harpe* as defined by Gosse, and which is typical in Papilionidæ and Sphingidæ, can, in our opinion, be designated by the same term, without risk of confusion; whether the term could be safely employed for the "basal process" of Scudder, as seen in many *Hesperidæ*, is rather doubtful.

Pierce has applied various terms to the different portions of the valve and its armature; these may be retained, but must probably be restricted in their use to the Noctuidæ, owing to the difficulty of applying them correctly in the other lepidopterous families. We would refer readers to the work in question for a full list of these terms.

Pierce's use of *Uncus* and *Scaphium* appears to be correct; he is wrong, however, in stating that the anal opening is ventral to the *Scaphium*; as shown by Zander it clearly passes between these two appendages of the XIII segment. The *Subscaphium* of Pierce, defined as a similar process to the *Scaphium*, but below the anus, is probably but a portion of the latter.

The Ringwall of Zander is termed *Juxta* by Pierce; like most other authors he has fallen into the error of considering the blind pouch containing the retractory muscle to be the end of the Penis, which thus appears to receive the seminal duct through a lateral opening. His *Ædoeagus* is but the strongly chitinized distal end of the Penis proper, and his *Vesica* the Ductus ejaculatorius which, as previously stated, is eversible.

In conclusion, we summarize the results of the above paper, and present the following list of terms for the more important portions, which we would recommend for general use:

Valves or *Clasps*.—(= Harpes of Smith and Pierce). The two lateral outer appendages.

Harpe.—(= Clasper of Smith and Pierce). Inner hook-like armature of Valve, arising from or near base of same.

Uncus.—Hook-like dorsal appendage of XIII segment.

Scaphium.—Process arising immediately ventral to *Uncus* and anal opening.

Ring-wall, *Penis funnel* or *Juxta*.—Chitinous cone at the base of the valves from which the Penis protrudes.

Penis.—A strongly chitinized rod-like structure projecting from the Penis funnel. (This is strictly speaking only the distal end of the organ, but for descriptive purposes all that need be considered).

Ductus ejaculatorius or *Vesica*.—A membranous tube, passing through Penis, and sometimes seen protruding from its distal end, forming a sort of cap.

Saccus.—A medio-ventral chitinous sac projecting forwards into the abdomen and attached to the anterior margin of XII segment.

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THE "EYE-SPOTS" OF *ALAUUS OCULATUS*.

BY F. ALEX. MCDERMOTT, WASHINGTON, D. C.

The large elater, *Alaus oculatus*, whose pronotum bears the two large black-and-white eye-spots which give the insect its species name, is a prominent specimen in practically every large collection of Coleoptera in this country; and if not the *oculatus*, then some of its near relatives, similarly marked, will surely be there. Usually, also, one will find in these collections, the cucuyo, *Pyrophorus noctilucus*, or some of its allies, whose thoracic portions bear two spots very similarly situated, but this time of a yellow colour and smaller, and during the life of the insect emitting that remarkable light, which was the basis of the researches of Langley and Very, "On the Cheapest Form of Light."* Those who observe these insects, either alive or dead, would naturally wonder whether the *oculatus* might not be luminous, or at least have beneath its chitin some structure indicating that the eye-spots were a degradation of the photogenic organs of the cucuyo. In the matter of classification, the insects are not particularly closely related; both are elaters, to be sure, but in different subfamilies, and not very strikingly similar in their mode of life.

The extremely hard chitin of the *oculatus* renders it a difficult subject for histologic work. However, the idea above mentioned, that there might be some sub-chitinous structure, occurred to the writer some time ago, and in pursuance thereof, he has attempted to gain some knowledge of the structure of these eye-spots. A number of sections have been made by hand, the sub-tissues being stained with acid carmine, and the mounting being in paraffin. While the general statement may be made that there is no special organic structure beneath these eye-spots, the observations upon them seem to justify publication, as a matter of interest, inasmuch as no previous paper appears to have been published on this point, so far as I have been able to ascertain, though to my knowledge, others have been interested in this same subject.

Each spot consists of an elliptical, convex area, whose edge is depressed below the surrounding thoracic chitin. Under a low-power lens they appear to be covered with a dense, black pile, like black velvet, while the edge of the spots bears short, coarse white hairs. With higher powers the velvety pile resolves itself a mass of flat, scale-like chitinous hairs, showing a few longitudinal ribs, and slightly concavo-convex. Their general shape under the lens resembles the chaff from grain. The white hairs of the edge are similar, but coarser. Both are hard to remove, and

* Smithsonian Misc. Coll., No. 1258, Washington, 1901.

considerable friction must be applied to remove them from the surface of the spot. Neither the white nor the black hairs differ from the hairs of similar colour found on the elytra and other portions of the body. The hairs do not ordinarily grow singly, but bundles usually of from two to five spring from the same point, and at the base of each bundle there is a depression in the chitin; these depressions give the bared chitin an appearance as if etched with acid. The black hairs are dull black, the chitin shiny black.

Under the "eye-spot" the chitin is somewhat thicker than that of the remainder of the thoracic covering. In common with the chitin of the remainder of the thoracic portion, that of the eye-spot is divided into three layers. The outer layer is quite thin, hard, brittle, opaque and jet black, and probably forms a kind of enamel; the second layer is thicker, dark brown in colour, and dense and hard; the inside layer is softer, lighter in colour, and very tough; it is the thickest of the three layers, and appears to be somewhat vascular near its inner surface, though this appearance may be due to muscular attachments at this point. Directly under this inmost layer are the muscles of the thoracic cavity, in which could be seen the usual respiratory tracheæ. No special structures were observed, and certainly nothing suggesting the structures found in luminous organs. Certainly none of the specimens the writer has seen alive has been luminous.

While these spots appear to be somewhat more than merely a portion of the general scheme of pigmentation, it seems hardly likely they represent any special sense organ. The thickened chitin is opposed to this view. It may, of course, be a rather extraordinary development of protective colouration. In this connection it is of interest to note that related insects are found in various portions of North America, in some of which there is much more of the white colouration, with more pronounced "eye-spots" than in *oculatus*, while in some others these spots have dwindled until they are mere black specks.

Somewhat related to this question in *Alaus* is that of the yellow spots on the elytra of the Indian Buprestid, *Chrysochroa ocellata*, which Latreille reported to be luminous, and in which he has been followed by a number of writers. Through the kindness of Mr. H. S. Barber, of the National Museum, I was permitted to examine specimens of this insect and closely-related species. This large and beautiful insect is coloured mainly in rich tones of red, blue and green-gold; each elytron, however, bears a large, almost circular yellow spot, which lacks the metallic lustre

of the remainder of the insect. The colour of these spots is certainly not unlike that of the luminous organs of the Lampyrids, yet it is hard to imagine what possible use a truly diurnal insect would have for luminosity, and how it produces light in a portion so obviously unfitted for the delicate photogenic tissues as a thin, brittle elytron. Some of the related species show an extension of the yellow spot into a band completely crossing the elytra, together with a similar colouration along the front edge and a portion of the sides of the wing-cases, while still others have nearly one-half of the elytra surface taken up with this yellowish, non-metallic colouration.

ON THE IDENTITY OF (*TRICHOGRAMMA*) *NEOTRICHOG-*
GRAMMA JAPONICUM (ASHMEAD).

BY A. A. GIRAULT, URBANA, ILLINOIS.

In the first pages of the current (1911) volume of the Transactions of the American Entomological Society, I described a new Japanese genus of the family *Trichogrammatidae* based on this species, whose identity at the time was more or less uncertain. The genus was *Neotrichogramma*, and before *japonicum* was definitely known, the type species of the new genus was named *acutiventre* MS.; formerly, also, I identified the species as *N. acutiventre* Girault MS., namely, at the time the species was first seen by me. However, the error was corrected in the original description of the genus before publication, but it is desirable to make a brief explanation concerning the basis for claiming identity. This explanation should be expected, if not demanded, for the reason that we have already taken too much for granted in systematic work.

Trichogrammatids have been especially difficult to identify, mostly for the reason that many of the species were wrongly placed as regards genera and also briefly, or else erroneously, described and the type specimens missing or in bad condition. For this reason it once seemed hopeless to me to attempt to identify more than a small fraction of the described species of these minute parasites. Because of the confusion existing in the literature concerning the definition of *Trichogramma* Westwood, and more especially because a comparatively large number of species of different genera had been described as members of this genus, I was forced to conclude that the position of *japonicum* was uncertain generically; its brief original description gave no generic characters, the author of the species had previously described several common species of the family as members of *Trichogramma*, which subsequently have been shown to be

generically distinct, even from each other and his latest (Ashmead, 1904), diagnosis of *Trichogramma* was wrong, and would lead to the belief that *japonicum* was entirely different structurally from what it really is; moreover, as I will show, it is variable in colouration, again misleading me, since the original specimens were black, those first in my possession yellowish-brown.

The identity of this species was not suspected until some months after I had drawn up the description of *Neotrichogramma* from the specimens which had been named in MS. *acutiventre*. In January, 1911, Dr. L. O. Howard very kindly sent to me for identification a second lot of the same kind of egg-parasites, consisting of six balsam slides labelled "Formosa, Japan, T. Shiraki." (Bearing sub-labels "No. 35," "No. 12" and "No. 13," respectively, bearing two males, one male plus two females, one male plus two females, two females, two females and one male in the order of their naming). The host was not given. All of these specimens were nearly black, with the exception of a single male of the "No. 13"; some were suffused with brownish. These specimens could not be separated from the others first seen by me, a part of which had been designated as the co-types of *acutiventre* MS., and they were consequently identified as that manuscript species, with a statement to the effect that perhaps the latter would prove to be identical with *japonicum*. Suspecting this to be true, after knowing of the colour variation and again consulting the literature, I addressed Mr. J. C. Crawford, of the U. S. National Museum, in regard to the types of *japonicum* heretofore not found, and he responded by sending me one male and four female specimens on tags, and which had been compared with the types (hence homotypes); these could not be separated from the specimens previously mentioned. They bore the label, "Ex eggs Chilo simplex, T. Fukai, Konosu, Saitama," and were coloured like the second lot above, varying from brownish to black, and were from the same host as the specimens first seen by me. Subsequently Mr. Crawford generously sent one of the type specimens (a female), and it in turn, as was to be expected, proved to be identical with the other. Hence there can be no doubt that the specimens mentioned in foregoing, more especially those upon which *Neotrichogramma* was founded, are all *japonicum* Ashmead.

(*Trichogramma*) *Neotrichogramma japonicum* Ashmead is parasitic on the eggs of the lepidopteron *Chilo simplex*; the specimens upon which Ashmead founded the species were stated to have been reared from

unknown lepidopterous eggs; probably they were reared from the same host. The species is fully redescribed in the place first cited above, but from the additional tagged specimens I have noted that the body is shiny, the sculpture inconspicuous, distinctly scaly, however, on the mesonotum; the parapsidal furrows are complete. In black specimens the mesonotum is suffused with yellow sometimes, and in all of the dark variations, the antennæ and legs remain unchanged or brownish-yellow. The usual colour, perhaps, is brown.

TWO NEW GALL MIDGES.

BY E. P. FELT, ALBANY, NEW YORK.

Toxomyia rubida, n. sp.

This species appears to be closely allied to *Toxomyia fungicola* Felt, from which it is most easily separated by its larger size, distinctly darker colour and presumably by a variation in food habit. It was reared February, 1911, by W. H. Patterson, St. Vincent, W. I., from the æcidiospores of *Uromyces pisi* DeBary on the leaves of *Euphorbia pilulifera*.

Male.—Length, 1 mm. Antennæ nearly twice the length of the body, thickly haired, light brown; 14 segments, the fifth having the basal portion of the stem with a length fully $2\frac{1}{2}$ times its diameter, the distal part with a length $3\frac{1}{2}$ times its diameter, the enlargements globose, each with a rather thick whorl of moderately stout setæ and a subapical circumfilum, the loops of the latter extending to the base of the following segment, and as in *T. fungicola*, they are produced on the dorsal surface somewhat; terminal segment produced, the basal portion of the stem with a length six times its diameter, the distal enlargement subglobose and apically with long, finger-like process. Palpi: First segment subquadrate, with a length $\frac{1}{2}$ greater than its diameter, the second $\frac{1}{2}$ longer than the first, tapering distally, the third a little longer than the second, more slender, and the fourth $\frac{1}{4}$ longer than the third. Mesonotum yellowish-brown, the submedian lines yellowish. Scutellum and postscutellum yellowish. Abdomen yellowish-orange. Wings hyaline, costa light brown, the third vein joining the margin just beyond the apex of the wing, the fifth at the distal third, its branch just before the basal half. Halteres yellowish-transparent. Legs mostly pale straw, the distal tarsal segments darker; claws moderately stout, strongly curved, the anterior unidentate, the pulvilli rudimentary. Genitalia: Basal clasp segment moderately stout,

truncate ; terminal clasp segment slightly swollen basally, long and evenly curved ; dorsal plate short, broad and broadly triangularly emarginate, the lobes obliquely truncate and sparsely setose ; ventral plate moderately long, slender, broadly and roundly emarginate, the lobes diverging, moderately stout, setose ; style long, stout, broadly rounded.

Female.—Length, 1.2 mm. Antennæ nearly as long as the body, sparsely haired, yellowish-brown ; 14 segments, the fifth with a stem $\frac{1}{3}$ the length of the subcylindric basal enlargement, which latter has a length three times its diameter ; subbasal whorl sparse, subapical band scattering ; circumfili moderately high and irregular ; terminal segment produced, with a length over three times its diameter, the apical process stout, with a length over twice its diameter. Mesonotum yellowish-brown, the submedian lines yellowish. Scutellum reddish-brown ; postscutellum yellowish. Abdomen rather thickly haired, yellowish-brown. Ovipositor short, the terminal lobes narrowly lanceolate, with a length about $2\frac{1}{2}$ times the width and rather thickly setose, there being two especially stout setæ apically.

Type.—Cecid a2140, N. Y. State Museum.

Lobodiplosis coccidarum, n. sp.

This remarkably interesting form was reared by W. H. Patterson, St. Vincent, W. I., in February, 1911, from larvæ preying on the eggs of *Dactylopius citri*. A study of other forms having similar habits, and an examination of the original description of *Diplosis coccidarum* Ckll., convinces us that the earlier-described species is very different from the one under consideration. This latter is tentatively referred to the genus *Lobodiplosis* because of the rudimentary lobe on the basal clasp segment, though the strongly-reduced terminal clasp segment and the lack of chitization in the harpes, so conspicuous in typical species referable to this genus, evidences a different line of development.

Description.—Male: Length, .75 mm. Antennæ $\frac{1}{2}$ longer than the body, thickly haired, light brown ; 14 segments, the fifth having the basal portion of the stem with a length $\frac{1}{4}$ greater than its diameter, the distal part with a length $2\frac{1}{2}$ times its diameter ; basal enlargement subglobose, subbasal whorl thick, moderately long, the circumfilum with rather numerous stout loops reaching almost to the base of the produced distal enlargement, which latter has a length $\frac{1}{4}$ greater than its diameter, a sparse whorl of stout setæ and subbasal and subapical circumfili, the lobes of the circumfilum extending almost to the apex of the

segment ; terminal segment produced, the basal portion of the stem with a length five times its diameter, the distal enlargement produced, swollen at the distal third and with a length about $2\frac{1}{2}$ times its diameter, the apex irregularly obtuse. Palpi : First segment subquadrate, the second subrectangular, with a length over twice its diameter, the third narrowly oval, a little shorter than the second, the fourth $\frac{1}{3}$ longer than the third, slender. Mesonotum dark reddish, the submedian lines yellowish-red. Scutellum yellowish-red, slightly fuscous apically ; postscutellum yellowish-red. Abdomen reddish, the distal margins of the segments slightly fuscous, especially the apical segment. Wings hyaline, costa light brown, subcosta joining costa at the basal third, the third vein uniting with the margin at the apex of the wing, the fifth at the distal fifth, its branch at the basal half. Halteres yellowish basally, fuscous apically. Coxæ, femora and tibiæ mostly a light fuscous-yellowish, the tarsi darker, the apical segments nearly black ; claws long, very strongly curved, the anterior unidentate, the pulvilli about half the length of the claws. Genitalia : Basal clasp segment moderately long, stout, obliquely truncate, the lateral angles produced as rudimentary setose lobes ; terminal clasp segment stout, with a length hardly twice its diameter, excavated and broadly rounded apically, setose ; dorsal plate moderately long, deeply and triangularly incised, the triangular lobes tapering to a sparsely setose apex ; ventral plate long, deeply and roundly emarginate, the lobes narrowly rounded apically and sparsely setose ; style stout, very strongly curved, narrowly rounded apically.

Female.—Length, 1.2 mm. Antennæ nearly as long as the body, sparsely haired, fuscous-yellowish ; 14 segments, the fifth having a stem about $\frac{1}{4}$ the length of the subcylindric basal enlargement, which latter has a length twice its diameter ; subbasal whorl moderately thick, subapical band thick, the setæ strongly curved ; terminal segment subcylindric, with a length over twice its diameter and apically with a short, knob-like appendage. Mesonotum dark red, the submedian lines yellowish-red. Scutellum reddish, slightly fuscous apically ; postscutellum reddish. Abdomen sparsely setose, deep red, the dorsal sclerites and the posterior $\frac{2}{3}$ of the segments dark red ; venter bright red. Ovipositor short, the terminal lobes narrowly lanceolate, with a length about twice the width and rather thickly setose. Other characters about as in the male.

Type.—Cecid a2141, N. Y. State Museum.

ADDITIONS TO THE JASSID FAUNA OF N. A. (HOMOPTERA.)

BY E. D. BALL, LOGAN, UTAH.

Thamnotettix Schwartzi, n. sp.

Form and structure of *Osborni* nearly, slightly longer and narrower, colour of *geminata*. Smoky cinereous, with two round black spots on front of head, and two angled ones on scutellum. Length, 5 mm.

Vertex blunt, rounding into front as in *Osborni*, but still shorter, margins almost parallel, twice wider than long, but little over half the length of the pronotum. Front inflated, parallel margined to just before the apex. Elytra long and narrow, very closely appressed, giving the insect a wedge-shaped appearance. Venation similar to *Osborni*, the third apical cell extremely long and narrow.

Colour.—Vertex pale yellow, slightly washed with orange, the ocelli red, a pair of round black spots between them equidistant from the ocelli and each other. Face pale yellow, the sutures dark, a few short smoky arcs on lower part of front. Pronotum cinereous. Scutellum yellow, a triangular black spot just within each basal angle. Elytra cinereous, the costal margin subhyaline, a narrow smoky stripe at apex. Veins of clavus and claval suture pale, veins on corium and a line along the claval suture smoky, emphasized on a line which follows the outer sector omitting its outer branch, and ends in the margin of the third apical cell.

Genitalia.—Female segment one-half as long as its width, posterior margin slightly rounding or sinuate, with a slight median projection as wide as the ovipositor. Male valve short, plates together gibbous at base and then rapidly narrowing into long, attenuate tips, one-third longer than their basal width.

Described from a pair from Dewey, Utah, collected by J. R. Horton, and one female from Ash Fork, Arizona, collected by Barber and Schwartz, and received from the U. S. National Museum. Named in honour of Dr. Schwartz, of the National Museum, whose collecting in Utah, Arizona and New Mexico has added so much to the knowledge of the Homoptera of this region.

Thamnotettix Kirkaldyi, n. sp.

Form of *Osborni* nearly, closely resembling *geminata*, smaller and with a more inflated vertex than either. Length, ♀ 4 mm.; ♂ 3.5 mm.

Vertex rounding, one-half longer on middle than against an eye and nearly as long as pronotum. Anterior margin rounding into front. Front

rather narrow and almost parallel margined until just before the apex. Elytra moderately long, appressed behind, costal margin curved, giving the insect a stout appearance. Venation regular, often an extra veinlet or two on the claval area, the third apical cell somewhat narrowed.

Colour.—Vertex creamy yellow, a pair of round black spots between the ocelli as in *Schwartzi*, another pair just outside and posterior to the ocelli, and a third and smaller pair equidistant from each other and the eyes at the base. Sometimes some brown markings midway between these and the apical pair assume the appearance of a pair of spots. Face creamy, the sutures and arcs on lower part of front, smoky brown. Pronotum cinereous, a row of submarginal dots set off by an arcuated line and some irregular mottlings on disc fuscous or brown. Scutellum creamy yellow, a pair of angular spots just inside the basal angles, the impressed line and a pair of round dots on anterior disc black. Elytra cinereous, shading to subhyaline on the margin, the nervures light, a narrow dark, smoky stripe in the cells between the claval nervures and another wider one just inside the outer sector of the corium, ending in the third apical cell.

Genitalia.—Female segment twice wider than long, the lateral angles rounding, the posterior margin triangularly emarginate, one-third the depth of the segment, with a strap-shaped tooth in the centre of the emargination as long as the segment. Male valve short, rounding, plates together, rounding at base, then narrowly attenuately pointed and upturned.

Described from ten examples from Tia Juana, San Diego and Salinas, California, collected by the author. This distinct little group of the genus already contains the names of Heidemann, who has made many eastern forms known; of Osborn, who has done so much in the Mississippi Valley; of Schwartz, for the intermountain region; of Coquillett, to whom we owe much of our knowledge of the Coast fauna, and it seems but fitting that we should add the name of Kirkaldy, who has done an immense amount of work on our Pacific Island fauna and whose recent untimely death is mourned by all.

Thamnotettix intricata, n. sp.

Resembling *flavocapitata* in size and form, slightly smaller, darker, with irregular reticulate veinlets. Rusty brown, with darker spots on vertex and milk white markings on elytra. Length, 5 mm.

Vertex slightly obtusely angled, the apex pointed, conical, half longer on middle than against the eyes, as long as the pronotum, slightly longer than its basal width, disc slightly sloping, anterior margin rounding to the full front except at the apex. Front and clypeus as in *belli*. Elytra long, inclined to be flaring posteriorly. Venation regular, but often obscured by numerous irregular reticulate veinlets on the clavus and in the ante-apical cells.

Colour.—Vertex pale, heavily washed with rusty brown, usually omitting a pale band before the eyes and often intensified as an oblique brown-dash either side the pointed apex. Face pale, with short brownish fuscous arcs and still darker sutures. Pronotum rusty or chocolate brown, with an anterior arcuated submarginal line paler. Elytra rusty or chocolate brown, with the nervures lighter, the irregular reticulations are usually strongly milky white and there is usually an oblique subhyaline light area beyond the middle of the costa. The apical cells smoky, with the nervures light.

Genitalia.—Female segment long, truncate or slightly concave posteriorly, with a broad angular median emargination, from which arises a strap-shaped tooth considerably exceeding the segment. Male valve triangular, apex round, plates strongly transversely convex, long, attenuate with the margins thickly beset with long hairs.

Described from four females and one male from San Francisco, collected by the author in September. The reticulate venation and white nervures will readily separate this species from any other described.

Thamnotettix rupinata, n. sp.

Form and general appearance of *intricata*, but lacking the supernumerary veinlets. Reddish or greenish brown, with a bisected black spot on the apex of vertex. Length, 5 mm.

Vertex slightly obtusely angular, the apex rounding, half longer on middle than against either eye, as wide as its median length in the female, narrower in the male, face long and narrow as in *intricata*. Elytra long and narrow, inclined to be closely appressed in the male, with the tips flaring, venation typical, regular, without extra veinlets.

Colour.—Vertex orange yellow, a large semi-circular black spot on the apex, bisected by the narrow, white median line, face pale, with narrow sutures and traces of arcs brown. Pronotum greenish or reddish brown, with a pale anterior margin, accentuated in the centre. Scutellum pale yellow, the basal angles olive. Elytra olive subhyaline with a reddish

brown cast. The venation obscure except the veinlets surrounding the apical cells, which are a dark rusty brown. The apices of claval veins milky white.

Genitalia.—Female segment moderately long, truncate posteriorly, with a median emargination and produced tooth as in *intricata*. Male valve small, inconspicuous, rounding, plates long, triangular, slightly attenuately pointed.

Described from two males and three females taken at San Francisco, California, in June and September, by the author. The large black markings and dark apical veinlets will at once separate this species from its allies.

Athysanus (Conosanus) Uhleri, n. sp.

Resembling *anthracinus*, but slightly larger and lighter coloured and with a more pointed vertex and shorter elytra. Black, with orange markings and pale nervures. Length, ♀ 4.5 mm.

Vertex slightly obtusely angular, the margins straight, twice wider than long, nearly twice longer on middle than against the eye. Pronotum half longer than vertex. Elytra broad and short, about equalling the body, posteriorly roundly truncate. Venation as in *anthracinus*, the central anteapical cell scarcely narrowed, apical cells broad and short, rarely much longer than wide.

Colour.—Black, a line on base of vertex with a point extending forward on either side, a pair of oblique spots against the eyes, a few spots near apex of vertex and on anterior part of pronotum, a pair of irregular stripes on scutellum and the elytral nervures yellow. A few traces of pale in the discal cells. Face black, a few short yellow arcs. Legs black, the anterior and middle pair abruptly yellow from just before the apex of femora. Hind tibia with the spines yellow.

Genitalia.—Female segment but little longer than penultimate, posterior margin roundly produced on median half, the lateral angles produced.

Described from two females collected by the writer at Ames, Iowa. In the Osborn and Ball Review this species was confused with the one described as *plutonius* Uhler. That is, however, a longer and narrower species, with a wider head and fuscous banded femora.

Athysanus (Commellus) estacadus, n. sp.

Resembling *Curtisii* in size and general appearance, but with a flatter,

black margined vertex. Straw yellow, with venation and margin of elytra light. Length, 3.5 mm.

Vertex almost flat, slightly transversely convex, a trifle shorter than its basal width. The anterior margin broadly obtusely angled, vertex and front meeting in an acute angle, the margin subacute. Front resembling *Osborni*, in general form, slightly more convex. Pronotum as in *Osborni*, slightly shorter; elytra as in *Curtisii*, scarcely longer than the abdomen; venation distinct, regular, resembling *Curtisii* except that the outer apical veinlets are decidedly curved.

Colour.—Almost uniform bright straw yellow, vertex with the margins light, a broad black band just back of the anterior margin, pronotum with a narrow, light, median band. Elytra with the nervures and margins light, the ground color intensified against the broader veins and margins. Face pale, a black spot on the clypeus, front fuscous with a median stripe, the upper margin and about six pairs of short arcs pale yellow.

Genitalia.—Female segment short, scarcely one-third as long as its basal width, posterior margin slightly broadly emarginate, disc of the segments slightly tumid at the apex of emarginations and brown margins, giving the appearance of a broad median tooth.

Described from three females from Texas, one of which was received through the kindness of E. P. Van Duzee. The black band on the vertex margin renders this quite distinct in our fauna.

Deltocephalus fraternus, n. sp.

Resembling *pectinatus*, but larger and darker, with shorter, less flaring elytra, ashy gray, with large quadrate spots on vertex and pronotum and the margins of the elytral cells fuscous. Length, ♀ 4 mm.; ♂ 3.5 mm.

Vertex long, acute, resembling *pectinatus*, but much longer, as long as in *areolatus*, nearly twice as long as the pronotum, disc flat, the margins straight to the blunt tip. Pronotum short, transverse, set well into the concave posterior margins of the head. Elytra shorter, less flaring than in *pectinatus*. The apices inclined to be narrow, rounding and appressed, exposing the last abdominal segment in both sexes. Venation similar to *pectinatus*, the claval nervures irregular and usually tied to the margins, central anteapical cell divided, often into four cells, in which case the posterior three are small and nearly circular, usually four reflexed veinlets to the costa.

Colour.—Grayish white, with a definite tawny tinge, vertex with the ivory apex broadly black margined, four large quadrate fuscous spots between the eyes and a triangular one between them and the apex, fuscous. Pronotum with six or eight angular and usually transverse spots. Elytra gray, with most of the nervures light, the cross nervures and reflex veinlets broadly light and mostly heavily fuscous margined. Face varying from black with a few pale arcs to black above and tawny brown below, but in any case the fuscous markings extend the entire length of the front on the sides.

Genitalia.—Female segment short and broad, the lateral angles produced into large, triangular, slightly depressed ears, posterior margin between the ears slightly convex, with a narrow median slit half way to base, the margins of which are usually produced into minute teeth, whole posterior disc of segment shining, black. Male valve long, triangular, stout, shining, the apex acutely pointed and slightly upturned, plates smaller, polished, narrow, only appearing as ridges outside the long valve and terminating as two finger-like projections fitting down into the inflated pygofer.

Described from one female from Jacksonville, Florida (Mrs. Slosson), in the author's collection, and three males and six females from St. Petersburg, Sanford, and Oaks, Florida, received from Mr. Van Duzee. The long vertex, with definite quadrate fuscous markings and the three small cells in the anteapical like the "three links," renders this a striking and easily recognized species.

Deltocephalus fraternus, var. *mendosus*, n. var.

Smaller and paler than *fraternus*, with the fuscous spots on vertex only faintly indicated in pale brown. Length, 3.5 mm.

Vertex shorter than in the species slightly variable, but with the same form at apex and with the black margin around the ivory tip, rest of marks on vertex and pronotum reduced to pale brownish traces. Elytra as in *fraternus* or slightly shorter, venation the same except that in the shorter forms one of the "three links" may be obscure.

Colour.—Grayish, washed with tawny, usually three black spots in a line on the elytra still remain, one against the cross nervure to claval suture, one against the "first" cross nervure and one against the apex of the third apical cell. Face black above, with light arcs, shading out to tawny below.

Genitalia.—Female segment moderately long, posterior margin slightly concave, the median fifth excavated, the excavation gradually or abruptly narrowing to a slit as in *fraternus*, posterior disc with a quadrangular black area.

Described from five females from Estero, Florida, received from Mr. Van Duzee. This may possibly represent a distinct species, the size and colour are always slightly variable in this group and are not specific. There appears, however, to be quite a difference in genitalia, although both are of the same general type and both slightly variable. A longer series will be necessary to definitely determine whether this is an extreme form adapted to some slightly different faunal region or a distinct species.

Deltocephalus micarius, n. sp.

Resembling *Weedii*, but larger and with longer and more flaring elytra. Brownish straw, with five stripes on pronotum, and nervures light. Length, 3.5 mm.

Vertex flat, almost twice as long, at apex as against eye, right-angled in front, the margins straight, the apex not at all produced as it is in *Weedii* and *compactus*, face as in *Weedii*, pronotum with the anterior margin strongly arched, elytra long and narrow, inclined to be flaring posteriorly, extending considerably beyond the abdomen in both sexes. Venation similar to that of *Weedii*, the outer claval area strongly reticulated with central anteapical cell elongated, constricted through the median portion and usually divided by a broad union of the nervures for some distance.

Colour.—Pale brownish straw, the vertex washed with orange, the margins and median line narrowly light, a pair of minute spots just back of the ivory apex and a larger pair midway to the ocelli black. Pronotum with traces of olive on the disc and five narrow light stripes. Elytral nervures light, slightly margined with brownish, which shade into fuscous against the first cross nervure to claval suture, again on the first cross nervure between the sectors and almost filling the apical cells, face fuscous brown, with short arcs on front and concentric markings on genæ light.

Genitalia.—Female segment short, the lateral angles rounding into the posterior margin, which is nearly straight except for a small median tooth. Male valve small, short, plates small, the outer margin concavely narrowing to the rather broad, truncate tips.

Described from two pairs from Seven Oaks, and Sanford, Florida, collected and sent by E. P. Van Duzee. In head characters this species

approaches closely to the *Sayi* group, but the reticulate venation allies it with *Weedii* and *compactus*.

Phlepsius nudus, n. sp.

Form of *ramosus* and *occidentalis* nearly. Stout, with a foliaceous vertex and sparse reticulation. Length, ♀ 6 mm.; ♂ 5 mm.

Vertex roundingly right-angled, disc flat or depressed, anterior margin thin and produced beyond the line of the front, front broad above, regularly narrowing from just below the ocelli to the straight clypeus. Pronotum short, scarcely longer than vertex. Elytra broad, short, venation distinct, regular.

Colour.—Dirty straw, slightly tawny on vertex, disc of pronotum and angles of scutellum washed with brown, disc of scutellum pale, with a pair of brown points, elytra subhyaline, slightly milky, with the veins and a few scattered reticulations, tawny brown, face brown.

Genitalia.—Female segment long, truncate behind, surface strongly convex, with a sharp, median carina on disc and traces of two faint lateral ones. Male valve equilaterally triangular, the apex rounded, plates narrow, together long, spoon-shaped, three times the length of the valve, the apices narrowly rounding.

Described from a male from Seven Oaks, Florida, and a female from Fort Meyers, Florida, received from Mr. Van Duzee. This is the smallest of the *humidus* group of Phlepsids and is easily recognized by the lack of reticulation on the elytra.

SHORT NOTES ON INSECTS.

We wish to call your attention to the Editor's request on page 314, Vol. XLII, for notes on habits, food-plants, unusual captures of insects, etc., particularly Canadian species. Not only would such short notes add to the interest of this magazine, but would greatly help those connected with issuing the numbers in filling up spaces. It should be a simple matter to comply with this repeated request during the summer months, at all events.

A. F. W.

ERRATA.—Vol. XLIII, page 42, line 4, after type insert the word *and*; page 80, line 11 from foot, for Vol. VIII read XXXVIII; page 83, lines 3 and 5, also page 85, under figure, for *zerœ* read *zeroë*; page 145, line 18, for *donating* read *denoting*.

A NEW GEOMETRID GENUS, AND A NEW SPECIES FROM THE EXTREME SOUTHWEST.

BY RICHARD F. PEARSALL, BROOKLYN, NEW YORK.

(Continued from page 332, Vol. XLII.)

In continuing my paper, the title becomes doubly appropriate, for it is necessary to erect still another genus for the reception of a species, whose position would seem to fall between *Pherne* Hulst and *Stenaspilates* Pack., although it differs from these associated genera in having veins 6 and 7 long-stemmed in secondaries. It is to be regretted that none of the examples before me is a ♂, so that my diagnosis refers only to the ♀

form, but I seek to supplement it by presenting a figure of the venation herewith, and call the genus

Apicrena, nov. gen.

♀.—Palpi long, beak-like, the terminal joint long and drooping; antennæ long, strongly pectinate to tips. Front loose scaled, with conic hair-tuft above clypeus. Tongue developed, thorax and abdomen without tufts, the latter heavy. Fore tibiæ unarmed, hind tibiæ long, slightly swollen, with two pairs of spurs. Primaries long, falcate at apex, margin doubly crenate to vein 4, straight to anal angle, 12 veins, 10 and 11 from cell, 8, 9 and 10 joining beyond cell at a point, 11 barred with 12 above cell, 6 and 7 from point, 3



FIG. 11.—Venation of *Apicrena*, nov. gen.

and 4 separate. Secondaries rounded at apex, margin with a strong excision between veins 6 and 4, vein 8 parallel to cell for half cell's length, 5 wanting, 6 and 7 long stemmed, 3 and 4 separate. No foveæ present.

Type *Apicrena calcaria*, n. sp.

Expanse, 32 mm. All above white, more or less sprinkled with pale chocolate scales, the primaries, thorax and head being quite evenly coloured and darker, while the abdomen and secondaries are nearly white, the latter thinly sprinkled, but shading slightly darker toward margin. Along costa of primaries a few fine black scales are scattered, clustering

somewhat toward apex and darkening it. In one specimen a few ochreous scales are clustered centrally on thorax and at sides of abdomen. The basal and extradiscal are firm, rather broad, pure white lines. The former starts from costa one-fourth out, running straight, or nearly so, to a point on inner margin, more than half way out to anal angle. The latter one-fifth from apex runs to inner margin, curving slightly outward at centre, and again before reaching inner margin, about 2 mm. outside the point touched by basal line. Another indefinite white line traverses the subterminal space centrally, running toward outer margin to vein 5, thence parallel to extradiscal, reaching inner margin just within anal angle. Discal dots on primaries are white, in one example small, obscured, in the others large, linear, and clubbed at lower end. None on secondaries. Fringes the colour of wings. Beneath the primaries are dusky, darkened submarginally and sprinkled with fine black atoms along costa and at apex. The cross lines are faintly reproduced as above. The outer clear white at costa. The subterminal shows only from costa to vein 7 as a clear white dash. Secondaries as above, but have an indefinite extradiscal white line from costa two-thirds out, parallel with outer margin nearly to anal angle, where it is lost in the white scaling which covers this and all the basal portion of wing. Outside this line the subterminal space is dusted with pale chocolate scales. No discal dots beneath. Body beneath and legs dusky white, lightly powdered with chocolate.

Types.—Two ♀s, taken IV 12, in Yuma Co., Arizona, one of which is in the author's collection, the other in Rutgers College collection at New Brunswick, N. J.

Chlorochlamys appellaria, n. sp.

Expanse, 13 mm.

Palpi short, slender, somewhat porrect. Front broad, dull red-brown. Antennæ, vertex, thorax, abdomen and all wings above have a ground colour of creamy or pale clay-yellow scales, solid and glistening. Over this is spread a thin covering of pink scales, sparingly on the pectinations of antennæ and central area of thorax, rather heavily on base of patagiæ, along sides of thorax and on basal segments of abdomen, leaving its tip and a dorsal line clear. The latter broadens on basal segments, running into central thoracic area. All wings above evenly dusted with pink scales, giving them a mottled appearance, and leaving the *cross lines* and a narrow costal band of the ground colour. These lines cross all wings, as in our

common *chloroleucaria* Guenée, though more slender and slightly waved. No discal dots. Fringes of ground colour, pinkish at base. All wings beneath and body a paler clay-yellowish, the primaries subcostally and near base faintly tinged with pink, as are also the femora. No cross lines apparent or discal dots.

Types.—Two ♂ s, taken VIII 19, in Yuma Co., Arizona. One of these in the author's collection, the other in that of Rutgers' College at New Brunswick, N. J.

The following well-known species were also present from localities as noted :

Hydriomena neomexicana Hulst.—1 ♀, Doble, Calif., August.

Hydriomena grandiosa Hulst., = *implicata* Guen.—1 ♀ Walters' Sta., Calif., April.

Pigia multilineata Hulst.—2 ♂ s, 1 ♀, Yuma Co., Arizona.

Euacidalia sericiata Pack.—1 ♂, Yuma Co., Arizona.

Cosymbia myrtaria Guen. ?—1 ♀, Yuma Co., Arizona.

Chlorochlamys chloroleucaria Guen.—2 ♂ s, Yuma Co., Arizona.

Dichorda illustraria Hulst.—1 ♀, Yuma Co., Arizona.

Fernaldella fimetaria G. & R.—14 ♂ s, 3 ♀, Yuma Co., Arizona.

Chloraspilates profugaria H. Sch.—1 ♀, Yuma Co., Arizona.

Deilinia perpallidaria Grote.—1 ♂, Yuma Co., Arizona.

Deilinia carnearia Hulst.—1 ♂, Yuma Co., Arizona.

Sciagraphia mellistrigata Gr.—7 ♀ s, Yuma Co., Arizona, and Walters' Sta., Calif.

Sciagraphia heliothidata Guen.—1 ♂, Yuma Co., Arizona.

Macaria S-signata Pack.—2 ♂ s, Yuma Co., Arizona.

Sciagraphia irrorata Pack.—10 ♂ s, 2 ♀ s, Yuma Co., Arizona, and Walters' Sta., Calif.

Euemera juturnaria Gu., var. *californiaria* Pack.—4 ♂ s, Doble, Calif., August.

Alcis depromaria Gr. ?—2 ♀ s, Yuma Co., Arizona.

Synglochis perumbraria Hulst.—1 ♂, 1 ♀, Yuma Co., Arizona.

Sabulodes truxaliata Guen.—2 ♂, Doble Calif., August.

CORRECTION OF NAME IN DIABROTICA.

At the top of page 92 of your current volume I note a typographical error, the name should be *semisulcata* in place of *semisuclata* as printed.

FRED. C. BOWDITCH.

SOME INSECTS FROM STEAMBOAT SPRINGS, COLO.—III.

BY T. D. A. COCKERELL, UNIVERSITY OF COLORADO.

COLEOPTERA.

Determined by Mr. Chas. Schaeffer, except the Histerid, which was determined by Mr. George Lewis.

Elaphrus lecontei Crotch.—Previously known in Colorado only from Buena Vista.

Platynus sinuatus Dej.—Not in Wickham's Colorado list; reported from New Mexico.

Platynus piceolus Lec.?—Widely distributed in Western Colorado.

Gyrinus affinis Aubé.—Reported from "Colorado" by Ulke.

Pederus compotens Lec.—Reported from Canon City and Buena Vista.

Hippodamia spuria Lec.—Widely distributed.

Saprinus vitiosus Lec.—Many specimens, differing greatly in size. A species of California and Arizona, new to Colorado.

Canthon simplex, var. *corvinus* Horn.

Canthon simplex, var. *humeralis* Horn.—New to Colorado.

Aphodius alternatus Horn.—Widely distributed in Colorado.

Diplotaxis obscura Lec.

Limonius, sp.

Acmaeops longicornis Kirby.—Common in Colorado.

Orsodachna atra Ahr.—Common in Colorado.

Chrysomela lunata Fabr., var.—A pretty insect, found in some numbers.

Phyllotrox nubifer Lec.

Pseudanthonomus validus Dietz.—Reported from "Colorado" by Dietz.

Elleschus ephippiatus Say.

NEUROPTEROID INSECTS.

Determined by Mr. N. Banks.

Tænionema analis Banks.

Chrysopa, n. sp. (near *oculata*).

Raphidia oblita Hagen.

Brachycentrus similis Banks.—Described from Colorado.

HYMENOPTERA.

Determined by Mr. S. A. Rohwer.

Aphlidictium rubripes Cresson.—Both sexes. The species was described from a female collected by Morrison in Colorado.

Ancistrocerus sexcingulatus Ashmead.—Both sexes. I have also collected this at Eldora, Colorado, Aug. 19, at flowers of *Grindelia subalpina*.

A NOTE ON THE ESSENTIAL CHARACTERISTICS OF
PRESTWICHIA AQUATICA LUBBOCK.

BY A. A. GIRAULT, URBANA, ILL.

This peculiar aquatic trichogrammatid has been so very little understood in regard to its essential characteristics—its systematic position has long been disputed and its characteristics erroneously described—that I have drawn up the following descriptive notes. In the first place, I desire to confirm its present position as a member of the Trichogrammatidæ; and secondly, to state that I have before me several females of it which agree exactly with the generic characteristics as at present understood, and with the specific characters of the female as described originally by Lubbock, and in general as recently figured by Schmiedeknecht. The specimens were very kindly sent to me by Dr. Richard Heymons, Director of the Königl. Zool. Museum at Berlin, in the vicinity of which place it was collected. It should be understood that the figure of the female given by Schmiedeknecht is not correct in regard to the details of structure. The same is true of the figure of the male given by Willem.

The following description is appended:

Female.—Length, 1.45 mm., including ovipositor.

General colour black-brown; legs, antennæ, all of thorax except pronotum and mesoscutum, which are brown, tip of abdomen and sheaths of ovipositor (last abdominal segment) and the ovipositor itself, gamboge; distal or third tarsal joint and tip of ovipositor darker. Mesoscutum with distinct polygonal sculpture. Colours contrasting and characteristic.

Wings appearing as described and figured by Willem for the male, excepting that with these specimens a strong vein runs along the cephalic wing margin of the minute fore wing, terminating before tip (the wings are not developed to perfectness in the specimens before me, and casually appear like those of the male; in one specimen, however, I could plainly discern the shrivelled portions of both a fore and posterior wing). Legs long and slender, the coxæ large, rounded, those of the posterior legs much larger, conical, as long as the slender, proximal tarsal joints of those legs; femora only slightly thickened; tibiæ long and slender, setigerous; tarsi plainly 3-jointed, the joints long, longer in the caudal tarsi, there the proximal tarsal joint longest, over a third longer than the posterior tibia, long and slender but not greatly so; proximal tarsal joint of the cephalic legs short. Tibial spurs single, slightly curved, short, shorter on the

cephalic leg, cephalic tibial spur terminating in three fine spine-like points; strigils absent. A pair of rather distinct claws on each tarsus. Trochanters pallid, weakly 2-jointed.

Antennæ: Scape, pedicel, minute ovate ring-joint, one funicle joint and a 3-jointed club. Scape cylindrical, moderately long, curved, about twice the length of the rather long pedicel, slightly longer than the flagellum; ring-joint cup-shaped, very small, often completely hidden, appearing as a small bulb-like base at the funicle joint; pedicel long-ovate, nearly thrice longer than broad at the apex, obconic, nearly as long as the club; the single funicle joint small yet very much larger than the ring-joint, longer than wide, subcuneate, narrower than the pedicel and the club, and subequal in length to the proximal club joint. Club 3-jointed, ovate, the intermediate joint somewhat longest, the proximal joint slightly wider than long; articulation between the second and third joints indistinct, apparently absent in some cases. Pubescence apparently absent.

Mandibles with two distinct, equal, acute teeth; three normal ocelli on the vertex, the lateral ones near to but not touching the eye margins. Pronotum short, parapsidal furrows complete, distinct, curved; sides of abdomen clothed with sparse, long, stiff hairs, in more or less distinct, weak clusters. Abdomen long and pointed, the ovipositor exserted for about half its length (protected by the valves nearly to tip)*; abdomen sessile. Abdominal segments large†, distinct; scutellum and metathorax simple, weak but rather large. Eyes naked.

(From three specimens, two-thirds-inch objective, one-inch optic, Bausch and Lomb.).

The foregoing notes taken from three females, Berlin, Germany, mounted together on a slide and deposited in the collections of the Illinois State Laboratory of Natural History, Urbana, Ill, as accession No. 44,231.

The species, though aquatic and swims with its legs, shows no marked adaptive structures for such a life; the hairs along each side of the abdomen, however, probably serve to protect the spiracles from the water.

*I can make out but six abdominal segments, the sixth or last one being long and tubular, reaching nearly to the end of the ovipositor and completely sheathing its valves. Hence, in one sense only the distal end of the ovipositor is exserted.

†The tubular distal segment is nearly a third as long as the remainder of the abdomen. The fifth segment of the abdomen is conical, rather broad at base and taken in conjunction with the sixth, which it enfolds at the latter's base, dorsad, is as long as half of the abdomen; the other segments are rectangular, somewhat wider than long, their margins straight.

TWO NEW SPECIES OF CYNIPIDÆ.

BY WILLIAM BEUTENMULLER,

American Museum of Natural History, New York.

Andricus Yosemite, sp. nov.

Female.—Head, thorax, scutellum and abdomen deep black. Antennæ and legs dark pitchy brown. Head distinctly granulated. Antennæ 15-jointed, third joint a little longer than the fourth. Thorax distinctly rugulose. Parapsidal grooves fine and continuous. Anterior parallel lines smooth and shining, not extending to the middle of the thorax. Lateral grooves fine and only indistinctly visible. Pleuræ rugulose. Scutellum rugulose like the thorax, with two large shining foveæ at the base; apex slightly curved, almost truncate. Abdomen smooth and shining. Wing hyaline, veins brown. Second cross-vein heavy and infuscated on each side. Radial area open. Cubitus continuous. Areolet large. Length, 3 mm.

Gall.—On the twig of *Quercus chrysolepidis*, in August. Polythalamous. Irregularly rounded or almost globular, with a small nipple at the apex. It is covered with many short spine-like projections. The surface is also somewhat wrinkled. Light yellowish brown, with some of the spines tipped with pink. Inside it is completely filled with a light brown porous or pulpy substance, and at the base at the place of attachment to the twig are a number of hard oval larval chambers close together, and imbedded in the soft part of the gall. Diameter about 20 mm. Larval chamber 4 mm. long.

Habitat.—Foot of Yosemite Falls, alt. 4,000 feet, Sierra Nevada, California. (Alfred C. Burrill.)

Described from five females cut from the gall. The species is allied to *A. singularis* and *A. Osten-Sackenii* in sculpture of the head, thorax and scutellum.

Andricus rugulosus, sp. nov.

Female.—Form robust. Head, thorax, scutellum and abdomen black. Legs: anterior pair dark brown, middle and hind pair pitchy brown-black. Antennæ dark brown, in some examples almost black terminally. Head finely rugose, face with whitish hairs. Antennæ 16-jointed, first joint stout, thickened at apex, second joint shorter, third and fourth long and almost of the same length, fifth and sixth shorter than the preceding, and of same length; following joints shorter. Thorax distinctly rugose, subopaque. Parapsidal grooves broad and shining at

the scutellum, gradually becoming narrower and very fine at the collar. Median groove continuous, fine and narrow anteriorly, broad at scutellum. Anterior parallel lines fine, close to the median line and extending to the middle of the thorax. Lateral groove rather long. Pleuræ rugose, finer rugose on the mesopleuræ. Scutellum large, rugose, more so than the thorax, with a very narrow carina along the middle. Foveæ at base distinct, shining, and widely separated. Abdomen globose, shining, and densely but minutely punctate. Wing hyaline, veins brown. Radial area open. Areolet very large. Cubitus not extending to the first cross-vein. Length, 2.75-4 mm.

Gall.—Singly or in clusters of two to about eight, on the trunks of young trees or along the stems of very young shoots of red and black oaks (*Quercus rubra* and *Quercus velutina*) late in April until early in May (8th), when the leaves begin to develop. Monothalamous. Ovate or bud-like, somewhat rough and longitudinally ribbed. Bluntly pointed at the apex. Soft, fleshy and green when fresh, often tinged with red. Hollow inside. When mature they drop to the ground, and when old they turn brown and become thin-shelled, with a large chamber inside. Length, 5-6 mm.; width, 3-3.25 mm.

Habitat.—New Jersey (Fort Lee district); New York (Van Courtlandt Park).

The perfect insect reaches maturity late in October, but does not emerge from the gall until April in the year following. The species is closely allied to *Andricus (Trisolenia) saltatus* Ashm. and *punctatus* Ashm.

The gall exudes a honey-like liquid, which is greedily partaken by ants, and, like *A. saltatus*, has the power of jumping, due to the contraction and sudden relaxation of the larva within.

INBREEDING OF LEPIDOPTERA.

At one of the meetings of the Montreal Branch last season, Miss Hutchinson, Leominster, Eng., exhibited a brood of larvæ of a Geometrid moth, *Eupithecia consignata* feeding on English hawthorn. These were descendants of a ♀ taken in 1874 and in all these years of inbreeding no change has been noted, except that both larvæ and imagoes have lost their desire to escape if left uncovered.—A. F. WINN.

Mailed June 2nd, 1911.

The Canadian Entomologist.

VOL. XLIII.

LONDON, JULY, 1911.

No. 7

A FEW NEW IPIDÆ.

BY J. M. SWAINE, MACDONALD COLLEGE, QUE.

Ips borealis, n. sp.—Length, $3\frac{1}{4}$ – $3\frac{1}{2}$ mm.; width, $1\frac{1}{3}$ mm. Sides parallel, smaller and more slender than *pini*. Head and prothorax black, elytra dark brown to black, legs and antennæ lighter. Prothorax three-fourths as long as the elytra.

Head rather prominent, globular, beak rather distinct with the angles square. Vertex and front convex; whole upper part of head remarkably smooth and shining. Front with a faint transverse impression extending between the eyes. In one sex the front is nearly as smooth as the vertex, very finely punctured with extremely minute hairs; in the other sex the front is densely, minutely granulate-punctate, and hairy below. These hairs from the front are brownish, slender, and erect. In both sexes the epistomal margin is densely fringed with yellowish or orange hairs; and close to the margin, and parallel to it, is a row of close-set, short tubercles. The eyes are elongate, broadly rounded above, and faintly emarginate in front. The genæ are sparsely punctured, aciculate, with large punctures below. The club is large, short-oval, with the first two sutures distinctly bisinuate.

The pronotum is longer than wide, hardly wider than the elytra; the sides are nearly parallel forward for three-fourths the length, then rapidly narrowed; the caudal margin is obtusely angled at the middle, with the hind angles rounded. The anterior half is rather coarsely tuberculate, as usual; the posterior half is shining, coarsely and sparsely punctured with the punctures slightly tuberculate on the sides, and a wide, smooth, shining, median space.

The elytral striæ are but faintly impressed, except the sutural striæ which are wide and deep; the stria punctures are medium in size, not close, and not regularly spaced; those of the sutural striæ are larger and closer. The intervals are wide and flat, and uniseriately punctured throughout their length. The punctures of the first two interspaces are closer and strongly granulate; those of the remaining interspaces are sparse on the disc, closer and granulate near the margin of the declivity;

closer on the sides and granulate behind. The first declivital tooth, that of the second interspace, is distinct and acute; the second and third are closely united; the second acute, the third longer, blunt, and incurved; the fourth is smaller, acute, and midway between the third and the raised apical margin. This raised apical margin is less elongate than in *pini*. The tip of each elytron is raised into a minute recurved tubercle. The declivity is not deeply concave, coarsely, irregularly punctured, glabrous, with the sutures strongly raised. The body is clothed above and on the sides with long, coarse, erect, brownish hairs. The disc of the pronotum and the central region of each elytron are less hairy. The long hairs of the elytra arise, as usual, from the interstrial punctures.

The only sexual characters observed are those of the front. This species is closely allied to *pini*; but quite distinct in the frontal characters and the long hairs of the discal interspaces of the elytra.

Ten specimens from spruce at St. Anthony, Newfoundland; collected by Mr. C. M. Spencer of Macdonald College. Type specimen with the front smooth and very finely punctured.

Ips longidens, n. sp.—Length, $2\frac{3}{4}$ – $3\frac{1}{4}$ mm.; slender cylindric, dark red to black, moderately clothed with long light hairs; allied to *latidens* but differs as below.

The head is coarsely, rugosely punctured; and has the front granulate, flattened, or faintly impressed transversely, with a narrow faint median carina extending to the vertex; the epistoma deeply emarginate on the middle line, with the epistomal fringe thicker and bright yellow from the emargination; the eyes broadly emarginate; the antennal club with the sutures bisinuate, nearly straight.

The pronotum is longer than wide, distinctly impressed on each side near the middle, broadly rounded behind, slightly rounded and gradually narrowed on the sides, more rapidly cephalad of the middle, and narrowly rounded in front. The asperations of the front half of the pronotum are of different sizes, the largest more or less concentrically arranged; the hinder half is shining, with a smooth median space and small, sparse punctures on the disc, becoming larger on the sides. The pronotum is sparsely hairy except the centre of the disc which is nearly glabrous.

The elytra have the sides parallel as far as the level of the upper margin of the declivity, then obliquely narrowed and squarely truncate, as viewed from above. The striae are distinctly impressed on the disc, less deeply on the sides, with the strial punctures large, quadrate, and

closely placed. The sutural striæ are rather narrower than usual, but deeply impressed. The interspaces are narrow, on the disc narrower than the striæ; and uniseriately punctured. These interstitial punctures are small at the base but become distinctly larger behind and are at times slightly confused near the declivital margin, where they are nearly as large as those of the striæ. Near the lateral margin the interstitial punctures are also larger towards the base. Near the declivital margin the interspaces are strongly roughened by the large, close, stria and interstitial punctures. The punctures of the first two interspaces are granulate, more strongly near the declivity. The long hairs are, as usual, from the interstitial punctures. The declivity is nearly perpendicular; flattened; coarsely, not densely, punctured; faintly pubescent; with the sutural interspaces raised and very faintly convex in profile. The declivital armature is peculiar, and approaches that of *latidens*. The first tooth, that of the second interspace, is small, acute, and curved ventro-mesad. The second tooth is longer, sharp and nearly straight; it arises from the anterior or dorsal margin of an acute ridge which extends downward to end abruptly (usually) just before the third tooth. This ridge is sometimes nearly entire, or it may crenate, emarginate, or bimarginate. When emarginate there is the appearance of an additional, small, blunt tooth. The third tooth is like the second, long, slender, straight and acute, and is usually separated from the ridge mentioned above by a short interval; it is succeeded, after a short interval, by the raised, acute, usually crenate apical margin. In some specimens (♂?) the second and third teeth are longer and blunt at the tip.

Twenty specimens from Hemlock, at Ithaca, N.Y.

This species differs from the *latidens* Lec., of California, its closest ally, in the longer pronotum, and distinct declivital armature. In *latidens* the second prominent tooth arises from the middle of the ridge. The published descriptions of *latidens* Lec. are given below. Original description by Dr. LeConte, Trans. Am. Ent. Soc., 1874, V 72: "*T. latidens*—Cylindrical, brown, shining, clothed with long erect yellow hairs, prothorax more parallel on the sides than usual; not much longer than wide; more broadly rounded in front; hind angles rounded; disc sculptured as in *T. pini*, more strongly impressed each side near the middle; elytral striæ deep, closely punctured interspaces each with a row of punctures; posterior declivity concave as usual; subsutural denticle small, acute, next tooth broad, composed of the confluence of three cusps, of which the

upper one is least developed and the middle one most prominent ; following this is a long acute tooth and then the usual apical acute margin. Length, .12 inch, 3 mm. California, Mr. Crotch. Smaller than *T. pini*, with a shorter prothorax and very different elytral sculpture and armature."

Description by LeCoate in Rhynchophora, page 367 : "This species is smaller (3 mm., .14 inch) than *T. pini*, and of more slender form. It is easily distinguished from all the other species by the much more deeply concave declivity of the elytra ; the cusp of the second interspace is acute ; the teeth of the fourth and fifth are united together, forming a ridge, which has three distinct cusps, of which the middle one is more prominent ; the tooth between this ridge and the terminal margin is unusually prominent. The striae are composed of deep close-set punctures, and the interspaces are marked with rows of small punctures. The sutures of the antennal club are nearly straight."

Trypodendron betulae, n. sp.—Length, 3-3½ mm.; closely allied to *lineatus* Oliv., with which it has commonly been confused in collections. Colour black, legs and antennae reddish, each elytron with a broad dusky-yellow vitta down the middle.

The head is subglobular in the female ; retracted ; front convex, punctured, coarsely granulate and hairy ; epistoma carinate on the middle line and raised along the front margin ; eyes divided, interocular space hairy ; antennae from a small fossa between the ventral portion of the eye and the base of the mandible.

Pronotum wider than long, 6 : 5, faintly margined and truncate behind ; sides nearly parallel behind and evenly rounded to the middle line in front, which is very slightly produced ; strongly roughened in front with transverse rugosities, which become small behind the middle, but are continued on the dorsum nearly to the base ; the sides behind are nearly smooth, finely punctured, with a smooth unpunctured spot on each side ; sparsely clothed in front with slender backward-pointing hairs. Prosternum narrow ; intercoxal process short, broadly triangular ; fore coxae subglobose, sparsely hairy.

Elytra longer than the combined width at the base, 10 : 6, sides parallel as far as the level of the top of the declivity, then rapidly narrowed to the tip ; striae faint on the disc, impressed on the declivity and distinctly impressed near the lateral margins ; striae punctures very small and shallow ; interstriae punctures of the disc extremely minute, those of the sides larger and with longer hairs ; they are confused towards the declivity and at the base ; declivity oblique, not flattened, but with the

first and second striæ conjointly impressed, much as in *lineatus* ; first and third interspaces of the declivity convex, forming the lateral margins of the impression ; the striæ tend to be impressed on the declivity and the interspaces to be convex, as in *lineatus* ; interspaces of the declivity with distinct, confused, setigerous punctures, making the declivity distinctly though sparsely hairy ; the interstrial punctures often minutely granulate.

Femora stout, distal lobes well developed ; fore tibia gradually widened ; regularly curved on the hind margin from near the base to the tip, and marked with a submarginal row of teeth distally, with small tubercles towards the base, and with sparse long hairs ; front margin nearly straight, mucronate at the tip, with stout distal-pointing hairs apically ; outer face hairy, and with many sparse conical tubercles shorter than the submarginal teeth. Inner face concave towards the tip and sparsely hairy ; front margin bent inwards and tuberculate near the tip (this shows only from the inner side). First three segments of the tarsus stout, with few long hairs above, and pilose below ; the fourth segment minute.

The hind tibia is more slender, hind margin slightly curved until near the tip which is broadly rounded at the outer angle, with submarginal teeth as in fore-tibia ; front margin nearly straight ; apical mucro more slender ; without tubercles on the outer face ; inner face with a row of spine-like hairs extending from the mucro diagonally to near the hind margin. This row of stout hairs, with the distal part of the hind margin forms a groove for the reception of the tarsus. First three segments of the tarsus stouter.

The antenna is reddish-yellow ; scape slender and strongly curved at the base, swollen at the apex, with the dorsal margin rather distinctly bent at the distal fourth, but not strongly angulate as in *lineatus* ; sparsely hairy, with longer hairs from the dorsal surface. The funicle four, segmented, first segment large, swollen distally ; second segment pedunculate, widened distally, third and fourth segments wider and shorter, saucer-shaped ; club longer than the funicle, oval, a little more strongly narrowed proximad, densely pubescent on both sides, with an acutely triangular, raised, more strongly chitinized portion at the base which is sparsely pubescent. The antenna of *lineatus* (from pine) differs in that the dorsal margin of the scape is sharply angled at the distal fourth ; the second segment of the funicle is longer than in *betula*, with the sides nearly straight, except at the extreme base, and gradually widened ; the club is more elongate than in *betula*, with the sides slightly rounded and

gradually widened from the nearly truncate, narrow base to near the apex, which is broadly rounded.

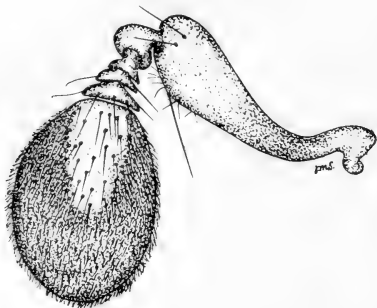


FIG. 12.—*Trypodendron betulae*, n. sp., antenna.



FIG. 13.—*T. lineatus* Oliv., antenna.

The male.—In the male the front is deeply and broadly concave, as in *lineatus*, with a median carina and the side margin of the depression fringed with long, erect, yellow hairs. The depression is very sparsely and minutely granulate-punctate, with inconspicuous setæ. The pronotum, from above, is wider than long, truncate before and behind, with the sides and angles slightly rounded. The asperations are but feebly developed. The hairs of the anterior half are long and curved backwards, and become shorter on the sides towards the base.

The sculpture of the elytra is often coarser in the males, with the striæ more distinct, and the declivital granules larger.

The tibia of the fore leg differs from that of the female in being more slender until near the tip, where it is suddenly widened. The fringe of the front margin is longer and very thick distally, without the distal tubercles. The hind tibiæ are rather more slender; hind margin toothed as before; outer face with very long stout hairs, longer and tuberculate at the base on the hind margin; front margin nearly straight, fringed with very long, slender, erect, wavy hairs; a row of spine-like hairs across the inner face as in the female, but more strongly developed. The first three segments of the tarsi are much stouter, flattened, and with the hairs from the under side longer than in the female.

This species differs from *lineatus* in the colour markings to be described below, and as follows: The declivity of *betulae* is distinctly hairy and the declivital interspaces are confusedly punctured; the declivital

interspaces of *lineatus* are uniseriately granulate-punctate, and the declivity indistinctly pilose. The lateral striæ of the elytra are impressed in *betulæ*; in *lineatus* only the last is distinctly impressed. The male of *betulæ* has a distinct carina in the depth of the frontal impression, and the hairs of the margin of the frontal impression and also of the anterior part of the pronotum are much longer than in *lineatus*. The male of *lineatus* has the carina usually faintly developed, and often represented by an anterior and posterior tubercle. The hind tibia of *betulæ* has a fringe of very long slender erect and wavy hairs on the front margin; this fringe is represented in *lineatus* by two or three of the long hairs.

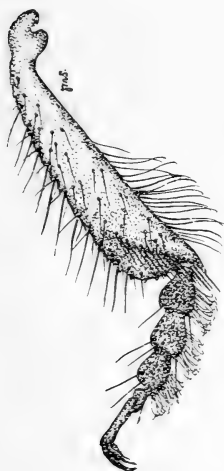


FIG. 14.—*T. betulæ*, n. sp., hind leg.

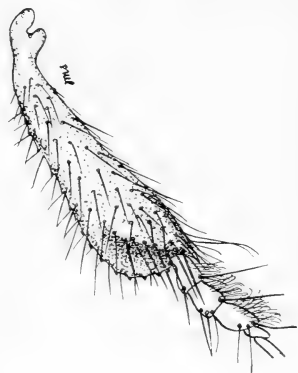


FIG. 15.—*T. lineatus* Oliv., hind leg.

The colour markings of *betulæ* seem to be quite distinct from those of *lineatus*. In *betulæ* the pronotum is dense black, and each elytron has the side and suture black, with a broad, dusky yellow band down the middle; usually the two black borders meet at the tip. There is considerable variation in the width of these black and yellow bands, but never a bright coloration nor an approach to the typical markings of *lineatus*. In *lineatus* the pronotum has the hind margin yellow or reddish. Each elytron has a black band along the side, the suture, and down the middle, with two yellow bands intervening, one between the lateral black border and the median black band, the other between the median black band and the black sutural border. The coloration is much brighter in *lineatus*.

In specimens from the Western Coast, which I have not separated from *lineatus*, the yellow caudal border of the pronotum extends forward to cover almost the entire disc, leaving the front angles black.

When specimens of either species are killed before completion of pigmentation, the bands are fainter, and the whole body may be yellowish.

With a large number of specimens before me, I find no difficulty in separating the two species from colour markings alone, and they are quite distinct in the other characters described.

I have taken the form which I consider *lineatus* or *bivittata* from conifers only, and *betule* only from deciduous trees.

Type specimens, ♂ and ♀, taken from *Betula lutea* at Ste. Anne de Bellevue, Quebec Province.

Phlebotribus piceæ, n. sp.—Length, 2-2¼ mm.; width, .8 mm. Colour brown to black; sparsely hairy; form more slender than *liminaris* or *frontalis*.

Head subglobose; front roughened by large, rather closely-placed punctures bearing slender yellowish hairs; above and on the sides minutely acupunctate; epistomal region concave, bounded above by a crescentic ridge; hairs from the concave area longer; antennæ arising from above the outer angle of the mandibles, as in *liminaris* and *frontalis*; antennal grooves short and deep; eyes entire and elongate.

Pronotum with lateral margins slightly rounded, distinctly narrowed cephalad; cephalic margin broadly rounded; caudal margin nearly straight, margined and deflexed; sparsely clothed with rather stout yellowish hairs arising from the sparsely placed, slightly tuberculate, very coarse punctures; scutellum minute.

Elytra rather elongate, sides subparallel, strongly narrowed behind; ventral margin of the declivity strongly serrate; base of elytra raised and margined with stout, recurved, crescentic tubercles; deeply punctate-striate; striae with large, deep, closely placed punctures which bear very short inconspicuous hairs; interspaces strongly raised, carinate, with a row of setose tubercles which are larger behind, forming the serrations of the declivital interspaces, and become reduced to granulate punctures at the base; interspaces of the declivity strongly serrate. The ventral margin of the declivity is a serrate ridge formed by the union of the 9th and 10th interspaces, which fuse on the anterior third of the elytra. The serrations of this ridge are triangular and prominent. The ridge extends across the caudal face of the declivity below to fuse with the third interspace.

The antennal scape is slightly widened distally, and narrowed at the tip; the first segment of the funicle is very large, wider than long; the remaining four segments of the funicle are very short, the 4th and 5th wider; club 3-segmented, much longer than the funicle, long, suboval, distally pointed, narrower than in *frontalis*, with the lateral dilations of the segments less elongate.

Hind tibiæ stout, much widened distally; outer margin slightly curved, broadly rounded distally; inner margin also distinctly curved, with a slender mucro at the tip; outer margin with one submarginal spine, and the distal margin with six submarginal spines and marginal tubercles, clothed with long, slender, plumose hairs. The outer margin is not so strongly curved as in *Phlæotribus*, and not straight with a truncate distal margin as in *Phlæophthorus* (see Eichnoff).

Ste. Anne de Bellevue, P. Q., Canada. In dead but green branches of *Picea canadensis*. Two broods annually.

This species differs from *liminaris* and *frontalis* in its smaller size, more elongate form, elytral sculpture as given above, and characters of antennæ and tibiæ. I have not seen *P. puberulus* Lec., but judging from his description, which is quoted below, this species is smaller and differs in its more strongly elevated and very strongly serrated elytral interspaces.

"*Phlæotribus puberulus* Lec.—(Bul. U. S. Geol. and Geog. Survey of Territories, Vol. V., 1880.) Cylindrical, black, nearly opaque, clothed with fine, erect, yellowish pubescence; base of antennæ and tarsi piceous. Head sparsely, finely punctured; front nearly smooth, shining, broadly concave, with two small acute cusps on the epistoma. Prothorax wider than long, sides oblique, slightly rounded, coarsely punctured, dorsal line obsolete, visible only near the middle. Elytra with shallow striæ formed of quadrate punctures; interspaces somewhat elevated, not wider than the striæ, with the hair arranged in rows. Length, 2.5 mm.

"Veta Pass, one specimen. This species resembles in appearance *Hylesinus opaculus*, but is quite different in characters. The joints of antennæ are less prolonged than in the other species, so that the club becomes elongate oval, and as long as the remaining joints united "

I have described this species as belonging to *Phlæotribus*, but it might quite as well go in *Phlæophthorus*. Mr. Eichnoff characterized *Phlæophthorus* Woll. and *Phlæotribus* Lat. as follows :

"*Phlæophthorus* Woll.—Antenna with a 5-segmented funicle and a 3-segmented long, pointed club, with the segments feebly widened on the

inward side. Venter not turned upwards behind, horizontal. Middle and hind tibiæ straight on the outer side, and the tip truncate.

"*Phlæotribus* Lat.—Antenna with a 5-segmented funicle and a much longer fan-shaped club divided into three long leaf-shaped segments. Venter arched, notably upturned behind. Middle and hind tibiæ rounded on the outer margin and toothed."

In *Phlæotribus caucasicus* and in *Ph. scarabæoides* the hind tibiæ are distinctly rounded and toothed on the outer margin. In *Phlæophthorus rhododactylus* the tibiæ are straight on the outer margin and abruptly truncate distally, with one tooth on the outer margin and a series of teeth distally. In *Phlæotribus frontalis* and *Phlæotribus liminaris* the outer margin of the hind tibiæ is strongly rounded and toothed, somewhat as in *caucasicus* and *scarabæoides*. In *P. piceæ*, n. sp., the hind tibiæ are slightly rounded on the outer margin, and broadly rounded on the distal margin, with one tooth on the former and a series of six on the latter. In *P. scarabæoides* the lateral extension of the segments of the club are very elongate; in *caucasicus* distinctly shorter; in *liminaris* still shorter; in *frontalis* shorter than in *liminaris*, and in *piceæ* and *puberulus* shorter than in *frontalis*. In *P. rhododactylus* these lateral extensions are barely noticeable. In these forms there is a distinct gradation in this character, and the difference between the conditions in the clubs of *scarabæoides* and *piceæ* is quite as decided as that between the latter and *rhododactylus*. In *caucasicus* and *scarabæoides* the antennæ are close together on the front above the inner angles of the mandibles. In *rhododactylus*, *liminaris*, *frontalis* and *piceæ* the antennæ are further apart, arising above the outer angles of the mandibles. In my specimens of *caucasicus* and *scarabæoides* the venter is distinctly bisinuate in profile, with the thorax convex, bending upward to the abdomen. In *rhododactylus* the venter sometimes exhibits this curve in lesser degree, but is usually nearly horizontal. In *liminaris* and *frontalis* the ventral curve is very feeble but variable, and in *piceæ* is scarcely to be detected.

This intergradation of character leads me to believe that *Phlæophthorus* Woll. is hardly more than a subgenus of *Phlæotribus* Lat.

The relations of *piceæ* to *liminaris*, *frontalis* and *puberulus* are indicated in the following key:

- A. Club with the lateral extensions of the segments more than twice as long as their width at the base.

Hind tibiae rounded and toothed on the outer side; pronotum not coarsely punctured and not tuberculate; elytral interspaces nearly flat and roughly punctured *liminaris* Harris.

AA. Club with the lateral extensions of the segments not more than twice as long as wide.

B. Club with the lateral extensions of the segments about twice as long as wide.

Prothorax granulate-punctate, elytral interspaces elevated and serrate, more strongly behind *frontalis* Zimm.

BB. Club with the lateral extensions of the segments about as long as wide.

C. Elytral interspaces somewhat elevated (see description) *puberulus* Lec.

CC. Elytral interspaces strongly elevated and serrate with granules, which become large and prominent on the declivity . . . *piceæ*, n. sp.

Type and paratypes of new species described above are in the collection of Macdonald College.

EXPLANATION OF PLATE II.:

(All are much enlarged, and drawn with a camera lucida.)

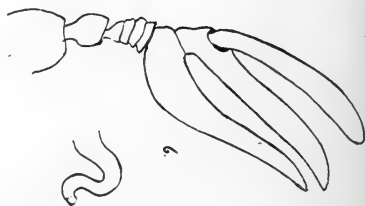
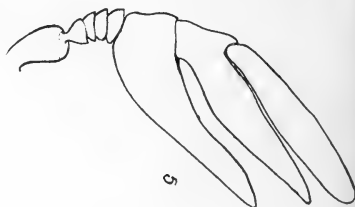
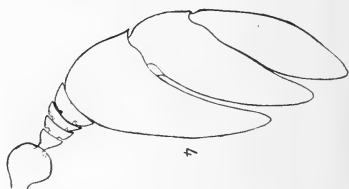
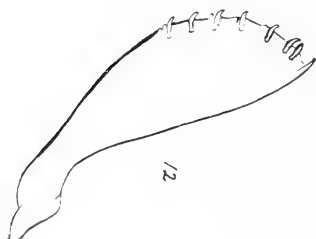
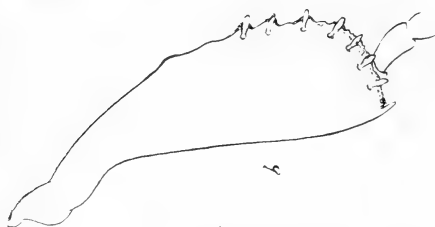
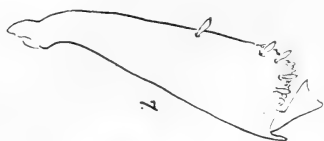
- FIGS. 1. *Phlæophthorus rhododactylus* Marsh, antennal club and outer part of funicle.
- " 2. *Phlæotribus piceæ*, n. sp., antenna.
- " 3. *Phlæotribus frontalis*, Oliv., antenna.
- " 4. *Phlæotribus liminaris* Harris, antennal club and funicle.
- " 5. *Phlæotribus caucasicus* Reitt., antennal club and funicle.
- " 6. *Phlæotribus scarabæoides* Bernard, antenna.
- " 7. *Phlæophthorus rhododactylus* Marsh, hind tibia.
- " 8. *P. piceæ*, n. sp., hind leg.
- " 9. *P. frontalis* Oliv., hind tibia.
- " 10. *P. liminaris* Harris, hind tibia.
- " 11. *P. caucasicus* Reitt., hind tibia.
- " 12. *P. scarabæoides* Bernard, hind leg.

A CORRECTION.—In "Notes on a Few Scolytidæ," in the May, 1910, number of the CANADIAN ENTOMOLOGIST, page 165, under "DD," the following error occurs: "Punctures of the elytral striæ more closely placed," should read, "punctures of the elytral striæ more *widely* placed."

J. M. S.

CAN. ENT., VOL. XLIII. ,

PLATE II.



A NEW CANADIAN GEOMETRID.

BY JOHN A. GROSSBECK, AM. MUS. NAT. HISTORY, NEW YORK.

The Geometrid here described was originally sent me among other species for determination by Dr. C. Gordon Hewitt, entomologist to the Dominion Experimental Farms, Ottawa. It was determined as probably new, and was later returned to me by Mr. Arthur Gibson in a good series, with the request that I describe it. I am unable to find any description that will cover the species, so I am calling it:

Selidosema Manitoba, new species.

Expanse, 27-34 mm. Head, thorax and abdomen with mixed grayish-brown and white scales, the latter sometimes almost absent, and sometimes, on the abdomen, predominating. A blackish spot at the base of each antenna, a bar of the same colour across the middle of the frons, and the posterior edge of the patagia and first three abdominal segments black. Ground colour of wings slaty-brown, verging toward paler gray, and occasionally in the median area of the primaries becoming wholly white. Basal line of primaries absent. Intradiscal line geminate, black, rather evenly curved outwardly, but slightly drawn in on the veins; extends from one-fourth out on costa to one-fifth or less on inner margin. A median line, rather narrow and diffuse and usually incomplete, passes across the centre of the wing. In the specimens with white median areas this line is absent, or shows merely as a point in several places. Extradiscal line black, moderate in width, evenly scalloped between the veins, and in general curving outward from the costa to vein Cu_2 , then inward to inner margin. A broken denticulate white line is sometimes present in the outer area. A whitish, subapical patch (intensified in the specimens with white centres) is also usually present in the outer area, the inner border of which touches the extradiscal line. Terminal line represented by a series of black triangular marks between the veins pointed inwardly. Discal spot, when present, a moderate sized ring pupilled with white. Fringe concolorous with the ground, tending to become checkered in some specimens. Secondaries with intradiscal line straight, broad and diffuse, occasionally showing on inner half of wing. Extradiscal line more defined, roundly denticulate, and in its course resembling that of the fore wing. Fringe and discal spot as in fore wing, but the latter never distinctly pupilled. Beneath, whitish or grayish, heavily but finely speckled with brown. The extradiscal line is sometimes strongly

indicated on both wings, but is usually absent. Discal spots showing more or less on all wings as rather large spots, rarely as rings.

Described from twelve male specimens collected by Mr. J. B. Wallis, at Winnipeg, Manitoba, May 25 to June 2, 1909.

The species is quite different from any other North American *Selidosema*, but closely resembles in general appearances *Alcis atrolinaria* Hulst and *Cleora areataria* Bwl. It is, however, different from both in the absence of any indication of a hair pencil on the posterior tibia.

The type is deposited in the Division of Entomology at the Central Experimental Farm, Ottawa. Co-types are in the collections of Mr. J. B. Wallis and the author.

ON *HALOBATOPSIS BEGINII* ASHM.

BY J. R. DE LA TORRE BUENO, WHITE PLAINS, N. Y.

In the course of preparing a synopsis of the *Gerridæ* of the Atlantic United States (and consequently of the Eastern part of Canada), it has been my endeavour to know at first hand, when possible, the forms to be included therein, and among them, naturally, the one herein treated:

Halobatopsis Béginii Ashmead, 1897, CAN. ENT., XXIX:56; Banks, 1910, Cat. Nearc. Hem. Het., 26; *H. Béginii* Bergr., 1908, Ohio Nat., VIII:373-4.

This species was overlooked by Kirkaldy and myself in our "Catalogue of American Aquatic and Semiaquatic Hemiptera,"* very fortunately, as it turns out, since thereby we were prevented from assisting in the perpetuation of an error; an error which, in the absence of the types, could not have been recognized from the description alone. In looking up descriptions, types, etc., for my studies in *Gerridæ* referred to, the U. S. National Museum authorities have been most good in allowing me the privilege of examination of their invaluable types and specimens named by the authors of species themselves. Among this material figure Ashmead's types (or what may pass as types, since they are from the type locality) of the species under discussion, labelled by himself. They are four specimens, in a more or less mutilated condition, three being *pinned*, but nevertheless clearly recognizable is the *immature stages or nymphs* of two unrelated GENERA! This fact has been established by careful comparison with long series of nymphs of the two species in question which have been taken abundantly in company with the adults, viz.: *Metrobates*

*Proc. Ent. Soc., Wash., X, pp. 173-215, 1908 (actual appearance in June or July, 1909).

July, 1911

hesperius Uhler, on Lake Mahopac, Putnam Co., N.Y., and *Rheumatobates Rileyi* Bergr., on various bodies of water in several localities in this near vicinity. Passing now to a specific consideration of each specimen, the following notes have been made. Three specimens bear handwritten locality labels. These are not very plain to me, but look (*very* roughly imitated) like "M. 27, 7, 96." I cannot venture to guess what this may mean, but it should appear from the original description, which I have not seen. Two specimens are *pinned* on one pin, one above the other as is usual in indicating the sexes, and the other is mounted on a point. The two on the pin bear a name-label:

"Halobatopsis

Béginii

Ashm."

in Ashmead's own handwriting. Both are dilapidated, but not to the same extent as the fourth one mentioned further on, and both have still the characters which enable one to recognize the genus and species. The upper specimen (therefore, presumably, the male) possesses unmutilated both antennæ, the front legs, the right middle leg, and the left hind leg. The left middle leg is lacking the tibia and tarsus and the right hind leg the tarsus. The lower specimen (therefore, presumably, the female) has lost the last three (?) joints of the left antenna, being otherwise in quite good condition. In "Ohio Naturalist" (l.c.), Bergroth remarks in referring to the species under consideration: "I am at a loss to make out why he (Ashmead) has placed it in the genus Halobatopsis, as the first antennal joint . . . is described as 'distinctly longer than joints 2 and 3 combined.' The 2nd joint, too, is said to be 'longer than the third, the latter being about three-fourths as long as the second.' Judging from the description *Halobatopsis Béginii* Ashm., belongs to a new genus." It is, therefore, fortunate that these two specimens should possess antennæ in good condition, as the preceding makes evident. I deem it neither necessary nor desirable to revert at length to these organs, for reasons readily deducible from what follows, because these structures at once determine the proper category of the two specimens. The upper one is smaller than the fourth specimen referred to and clearly belongs on antennal characters, even though we were to omit consideration of all others, to *Metrobates hesperius* Uhler, and is a nymph in the 3rd (?) instar. The lower one is an immature male of *Rheumatobates Rileyi* Bergroth, in about the 4th, or 5th and last, nymphal instar. Here again the antennæ, although not quite formed, begin to reveal the bizarre structure so characteristic of the males of this genus and the hind femora

already have indications of the curious distortion peculiar to certain of its species. The single specimen on a point, already referred to, is another nymph, somewhat smaller than the fourth, of *Metrobates hesperius* Uhler, very much shrunk and mutilated, having left only portions of three legs, the left anterior and right middle and posterior. The fourth specimen, on a very rusty and verdigrised pin, bears a printed locality label "Sherbrooke, Can.," and on another small label "418," in pen and ink. This is a male, more or less greasy and shrunk (the latter, by-the-bye, an evidence of immaturity), and has left to it only one whole and three half legs, the former being the right anterior, and the latter the femora of the left anterior and both posterior legs. The antennæ also are absent. The structure of the head, however, shows its affinities, and it agrees with nymphs in the 3rd or 4th instar of *Metrobates hesperius* Uhler.

It naturally follows from the preceding that *Halobatopsis Béginii* Ashm., has no real existence as a biological unit, in that it is a composite of two known species in as many different and unrelated genera, its only claim to attention being that it is an addition to our synonymies.

My valued friend, Mr. Otto Heidemann, of Washington, D.C., at the time these specimens were sent to me for study, called my attention to their being nymphs of *Metrobates* and *Rheumatobates*, and it is with peculiar pleasure that I make known here his independent arrival at this conclusion, the correctness of which a glance at the specimens made evident, and which careful study subsequently amply confirmed.

The synonymy of the two genera and species involved may now be corrected to read as follows :

Metrobates Uhler, 1871.

Proc. Bost. Soc. Nat. Hist., XIV, 108.

= *Halobatopsis* Ashmead, 1897, CAN. ENT., XXIX, 56 (not Bianchi), [in part, for nymphs].

Hesperius Uhler, 1871, l.c.

= *Béginii* Ashm. (*Halobatopsis*), 1897, l.c. [in part, nymphs of this species described as adults].

Rheumatobates Bergr., 1892.

Ins. Life, IV, 321.

= *Halobatopsis* Ashmead, 1897, l.c. (not Bianchi), [in part, for ♂ nymph].

Rileyi Bergr., 1892, l.c.

= *Béginii* Ashm. (*Halobatopsis*), 1897, l.c. [in part, for ♂ nymph described as adult].

FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MILLARVILLE, ALTA.

(Continued from p. 156.)

150. *Hadena indocilis* Walker.—The type is a female in the British Museum, and, according to the Catalogue, comes from Trenton Falls, N. Y. I have a New York female in my own collection, and Calgary specimens scarcely differ. It is the species standing in North American lists as *remissa* Hubn., which name refers to a variety, rather common in Europe, of a European species, well known as *gemina* Hbn., to which, however, Sir George Hampson, makes *obscura* Haw. a prior name, making *remissa* "ab. 2" and *submissa* "ab. 1," and apparently about intermediate. For further notes on these forms, vide under *ferens* and *enigra* (infra).

151. *H. alia* Guen. has priority over *suffusca* Morr., as pointed out by me in CAN. ENT., XLII, 190, June, 1910. Sir George Hampson makes the change in his Catalogue, Vol. IX, p. 500, antedating my remarks by about two months, though the volume had not appeared when I wrote them.

152. *H. rorulenta* Smith.—Sir George Hampson, after his description of this form, adds, "This is probably an aberration of *suffusca*." The type of *suffusca* I have not yet seen, and do not know to just what form it refers, but *alia* type is a somewhat reddish specimen of the even, non-contrasting form I had listed as *suffusca*. *Rorulenta* is very likely the same species. At any rate, I know nothing to make me wish to disagree with the suggestion, though I happen to possess no exact intergrades.

154. *H. contradicta* Smith.—Sir George Hampson creates a new genus, *Trichoplexia*, to receive this species and *exornata* Möschler. Of *contradicta* he gives a very good woodcut, showing the tuftings, and of a Labrador specimen under *exornata* he gives a coloured figure. I have no note that I compared the figure with the specimen, but should judge it to be misleading, as my note on the species says, "Suffused, and without black lines, but probably the same as *contradicta*," of which there were two Calgary males in the collection. I certainly should not have made the suggestion from the figure alone. Prof. Smith has five males in his collection from Newfoundland, one of them labelled Grand Lake, under *exornata*, which seemed to me probably a rather suffused form of *contradicta*. The "*exornata*" of the Washington collection is a female from Colorado, and is certainly not *contradicta* or closely allied thereto.

Neither is a Nova Scotia female under the same name in the American Museum of Natural History at New York. The type of *exornata* is presumably in the Möschler collection, wherever that may be. Labrador is given as the first locality in all the catalogues except Staudinger's, who gives "Mong. Labr." I have not taken *contradicta* here for some years.

155. Under this heading, in the second line, for "the species" read "the specimen," and I still hold to my suggestion that it is probably a variety of *passer*, under which I have now referred to it. I have not taken another like it. It is probably quite distinct from *morna*, of which *hulstii* Grt. appears to be a synonym. The types of both these names come from Colorado. That of *morna*, from Rio Blanco, is a male, in the Strecker collection, unset when I saw it, though described in 1878 or 9. It is a pinkish red species, and I referred it to *Luperina* in my notes, which add, "abdominal tuft extremely slight." Prof. Smith has the species correctly named in his collection I think, and in Jour. N. Y. E. S., XVIII, p. 138; Sept., 1910. refers it to *Sidemia* Staud., as used by Hampson, and likens it to *subornata* Staud., from Mongolia, as figured on pl. CXVIII, f. 31., of Hampson's work. From memory, he is about right, and as almost the sole differences between *Luperina* and *Sidemia* as characterized by Hampson are that the latter has more rounded apices and an abdominal crest at base, which the other lacks, I am not ashamed of my Mss. generic reference. But *passer*, which Sir George Hampson places under *Luperina*, has an abdominal crest at base. The only two North American species which he treats under *Sidemia* are *longula* Grote and *devastatrix* Brace. *Longula* I have not examined structurally, but *morna* is certainly more closely allied to *passer* than to *devastatrix*. I have seen the type of *hulstii*, a female, in the Græf collection at Brooklyn. In the Strecker collection, beside the type of *morna*, is a Colorado male marked "*hulstii* Grote," a little paler and more even only than *morna*. Strecker makes the reference in Suppl. 3, p. 32. The "*morna*" of Hampson's Catalogue is an ally, possibly a race of *conradi* Grote, as already pointed out by Prof. Smith. That of the Washington collection is the same species, in one drawer at least. But by some oversight, several drawers further on is another very distinct species also standing as *morna*, and certainly nearer to it than the other. It is the species I have already referred to under *passer* as probably undescribed.

156. *H. cerivana* Smith.—This differs from eastern *finitima*, of which it is probably only a racial form, chiefly in being paler and grayer. I

have no exact intergrades, but I am poorly off for outside material. Kaslo specimens are like my local series. Those from Vancouver Island (I have two specimens only) are much browner and more highly coloured, and much like some I have from New York. Whether European *basilinea* is distinct from *finitima* or not is perhaps unimportant. Sir George Hampson keeps them distinct, seeming to find, as my own series shows, that they differ slightly, though constantly, in intensity of colour and markings, *finitima* being the lighter and better marked. I wish to differ with no one who calls them the same species, though as they do not get a chance to habitually interbreed, how is the point to be decided? Prof. Smith's figures of the genitalia of all these in CAN. ENT., XXXV, plate 4, figs. 5, 6, 7, May, 1903, are not convincing.

157. *H. lateritia* Hüfn.—The type of *obliviosa* Walker, is a female in the British Museum, and comes from "Rocky Mountains" from Lord Derby. It may have been taken in Alberta territory. It was referred to *lateritia* by Prof. Smith in his catalogue, and Sir George Hampson follows him. I looked at the specimen for a long time, and had my doubts. It looks alpine, has a rough fluffy appearance, is very evenly gray powdered, seems narrower winged, and has better defined though very indistinct claviform than *lateritia* usually has. A Vancouver Island specimen was placed next it in the series to show the connection, but is rubbed, and does not to my mind prove its identity. However, I did not recognize it as any other species, and it may prove to be rightly placed.

Sir George Hampson makes *satina* Strecker a synonym of *lateritia*, and Prof. Smith upholds him in Journ. N. Y. Ent. Soc., XVIII, 139, Sept., 1910, mentioning that he has two examples like *satina* from Grand Lake, Nfld. I saw the type of *satina* in March, 1910. It is a worn male from Anticosti, taken, the description (1893) says, by W. Couper in 1873. I referred it at once and without hesitation to *commoda* Walker (= *alberta* Smith). I referred on the spot to Hampson's Catalogue, and was greatly surprised to find his reference to *lateritia*, an idea I refuse to entertain for one moment. My notes say: "Even leather brown, t. a. and t. p. line distinct, blackish. Eyes not lashed. Part of right antenna only, ciliate." I admit that I could not match it exactly in my series of *alberta*, all being darker, but feel confident that it will ultimately prove to be this species, or, just possibly, a very close ally. I would suggest that the Newfoundland specimens mentioned by Prof. Smith are not *satina*. Had that species been in his collection associated with *lateritia*, I must have noticed it. I have only within the last few weeks received Strecker's Supplement

No. 1, containing the description, and find that he led off on a wrong track himself by likening the species to *lateritia* and *dubitans*, adding: "But it is a smaller species, and otherwise quite different." It certainly is!

158. *H. cogitata* Smith.—Though its distinctness from *dubitans* Walk. is very doubtful, *cogitata* is the name I have decided to use for this form for the present. There is a male type, red, and a trifle variegated with paler shades, at Washington, from the Sierra Nevada, California, whence the form was described, Colorado being also mentioned under the description. By Smith's Catalogue there should also be types in his own collection and in the Neumögen collection at Brooklyn. I seem to have overlooked these.

This and *dubitans* are kept distinct on our lists, and Sir George Hampson treats them as two species, ascribing to *dubitans* in the table a black-brown suffusion, mentioned as lacking in *cogitata*. He has types *dubitans* Walk., *insignata* Walk. (*Apamea*, 1857), and *sputator* Grote, the latter, from Evans' Centre, N. Y., being the *sputatrix* of Grote's and subsequent lists. The two former are marked merely "U. S. A.," but are probably not western. The series under the name contains no western specimens. Type *dubitans* is a small red-brown specimen, with scarcely any trace of black-brown suffusion. Types *insignata* and *sputator* are darker and alike. His series under *cogitata*, with the exception of one, "Hudson's Bay (Barnston)," are all western, and include Calgary specimens. This is claimed by Prof. Smith to be the *Apamea insignata* of Walker, described in 1860, of which the type is probably with the Entomological Society of Ontario, though, judging from Smith's Catalogue, it may be at Rutgers' College. Walker, as above shown, had used the name, also under *Apamea*, in 1857, thus duplicating the name in the genus, even if not in the species. The two series in the British Museum seemed to me very doubtfully separable. Prof. Smith had Calgary specimens in his collection under *dubitans*. An occasional Calgary specimen has slight blackish suffusion, and matches my palest eastern specimens very well. But my blackest specimens come from Miniota, Man., and some of these have the pale part of the reniform distinctly yellowish, sometimes noticeable in paler eastern specimens. I know of nothing tangible by which *cogitata* and *dubitans* can be separated as species, though, as Dr. Barnes has pointed out to me, the Calgary form is not quite typical *cogitata*, which is really slightly variegated. I have a long series from Kaslo and Vancouver Island, but of all my specimens, the least

evenly coloured comes from Trenton, Ont. Whilst at the Brooklyn Museum I saw a series from Big Indian Valley, Catskill Mountains, from Mr. Pearsall, which were of the light red form, prevalent in Western Canada, and a series of larger and blackish specimens from the same locality, strongly suggesting two species, but whether *cogitata* and *dubitans* I cannot say.

160. *H. devastatrix* Brace.—I believe it has not been recorded before, that this species sometimes has spines on hind tibiae. I made the discovery accidentally about a year ago, finding that about fifteen per cent. of a number of my specimens which I examined had spines, varying from one to three, between and slightly exterior to the two pairs of hind tibial spurs. I wrote and asked Dr. Barnes to examine his specimens, and Dr. McDunnough replied that out of fifty or sixty examined, ten had from one to three spines. Prof. Smith reported that he found a single spine in the majority of his, but suggested that the character was probably really constant, and that the spine had been broken off from the rest. I doubt that explanation. Incidentally I have discovered the same variable character in several species allied to *Plusia*, concerning which I shall write later.

163. *H. versuta* Smith.—This species is one of the most regularly occurring Noctuids here. *Ducta* Grote, of which the type is in the British Museum, from Orono, Maine, seems to be very rare in the east, but will probably prove to be the same species, I certainly have seen *versuta* from Hymers, Ontario, and compared it with my Calgary series. Sir George Hampson's figure of *ducta* is of the type, and is pretty good, though there should really be a W in the subterminal line, a characteristic feature of *versuta*. *Miniota* Smith (An. N. Y. Acad. Sci. XVIII, 114, Jan., 1908), is certainly *versuta*. The description is made from three males and six females from Miniota and Cartwright, Man. My notes taken whilst at Rutgers College state that a female co-type of *miniota* is from Calgary. As the locality is not mentioned under the description it may be my mistake, and really be a co-type of *versuta*, which was described from two Calgary females. The male and female types of *miniota* are from the place of that name, and are the bronze-tinted form of *versuta*, referred to in my original notes. *Moilena* Strecker, described in 1898, I also refer to *versuta*. The type is a worn female from Loveland, Colorado. I have specimens from Yellowstone Park, Wyoming, and from Provo, Utah, and there are specimens, or a specimen, in Prof. Smith's collection from Glenwood Springs, Colo. In the Washington

Museum I compared specimens from New York, Orono, Maine, and Cartwright, Man., which seemed to me all the same species. I have a specimen from Field, B. C., and Dr. Dyar records *versuta* from Kaslo, suggesting that it may merely be the western form of *ducta*. I have a pair from Duncans, V. I., which are browner and rather more heavily marked only than some of my local series.

164. *H. ferens* Smith.—I make this a synonym of *runata* Smith, described from Winnipeg. I have examined a female type and a co-type of the latter in the Washington collection, two female co-types in Prof. Smith's collection, and a male co-type in the Strecker collection. Calgary specimens of *ferens* in the Washington collection are like the type of *runata*. The latter name stands in both Dyar's and Smith's lists as a synonym of *lona* Strecker, and Sir George Hampson makes the same reference, figuring as *lona* a female from Pullman, Washington. The figure is faulty, and the orbicular is not gray in the specimen, though that on the left side happens to be rubbed. I question whether the species figured is *lona*, of which I have seen Strecker's type, a female from Clyde, N. Y. This my notes say is "larger than *runata*, but doubtfully distinct." Pullman, Washington, is mentioned as a locality under the description of *runata*. It probably occurs there, as I have it from both Windermere, B. C., and Vancouver Island, but a male from Pullman, labelled "*runata*" in Prof. Smith's collection has lashed eyes, and seemed to me a *Eumichtis* near, and possibly not distinct from *versuta*.

Separans Grote, of which the male and female type from Evans' Centre, N. Y., are in the British Museum, Hampson treats as distinct. He figures the male type, but the dark markings of the figure are nearly all too pale. Its distinctness from *runata* is by no means certain. In the Washington collection is a male from Racine, Wis., labelled "*separans*, like type," which is slightly paler and more ochreous only than a male *ferens* from Calgary in the same collection.

I do not appear to have met with either *ferens* or *indocilis* here since publishing my original notes, in which I referred (under "*remissa*") to a close resemblance between them. I certainly have nowhere seen any intergrades, but the two are very close allies at best.

165. *H. enigma* Smith.—No more specimens have been taken here since my notes were published, and the material in my collection has dwindled to a single male co-type. In the Washington collection are a male from Calgary, and a specimen on a short pin, lacking abdomen and head,

labelled "*Mamestra insulsa*, named by Francis Walker." The two specimens are alike, but the species is, of course, not *insulsa*.

I am indebted to Mr. Prout for a good series of *gemina* Hbn. and its var. *remissa* Treit., from the British Isles. All these are of stouter build and more reddish brown than any of my Calgary specimens, but my co-type of *enigra* bears a closer resemblance to some of the typical *gemina* of this series than any *indocilis* do to *remissa*. They all seem to agree in antennal structure and tuftings, as they do with *runata*.

166. *H. cinefacta* Grt.—There is a female type from Wash. Terr. in the British Museum, which is figured by Hampson. Calgary specimens are, however, duller, and have maculation less clearly written than some of my specimens from California and Vancouver Is., but others from California are like my local series. A female type from "So. Calif." is in the Henry Edwards collection. This bears a closer resemblance to *Spaldingi* Smith (= *umbrifacta* Hamps.) than the British Museum type, as to its identity with which I am not satisfied.

I believe Hampson's figure under "*centralis*" to represent the same species as his *cinefacta*. It is certainly not *centralis*, of which I have a female from the type locality, the Sierra Nevada, which I have compared with the type and a series from the same locality in the Henry Edwards collection. This species has long, narrow, acute primaries, resembling *Parastichtis*, as used by Hampson in this respect, though the thoracic tufting of my specimen is rather that of *Trachea*.

167. *H. unita* Smith.—I have re-examined the female type in Prof. Smith's collection, and find the ground colour less blue-gray than memory had supposed it. It is a trifle bluer only than Calgary *cinefacta*. In maculation it bears a most peculiar resemblance to the common eastern form of *Mamestra subjuncta*. Like that, it has a large and nearly round orbicular, and is just as near that species in colour as it is to *cinefacta*. But it differs from *subjuncta* in having perfectly smooth eyes. Mr. Cockle has a Kaslo specimen in his collection which I have seen. I know of no others. The species figured by Sir George Hampson as *unita*, from Corvallis, Oregon, is certainly not this species, but probably *cinefacta*.

168. *H. alberta* Sm.—This, as Sir George Hampson catalogues it, is a synonym of *commoda* Walker. The type of the latter is attributed merely to "U. S. A. (Doubleday)," and may as likely as not have come from western Canada. It appears to be a small, brown, poorly-marked *alberta*. Another synonym of *commoda*, and prior to *alberta* I believe

to be *satina* Strecker, from Anticosti, for notes on which, vide supra, under *lateritia*. I have recently seen several specimens which I compared with my series and named *commoda*, from Hymers, Ont. Here the species varies from a dull sooty dark brown, almost black, to a reddish leathery brown, somewhat approaching *lateritia* in shade, though none of mine are as red as that. Most have very indistinct maculation, but a few have it quite clear, with cross lines distinct, blackish, and sometimes edged with gray. There is occasionally a black basal streak, reaching in one specimen to the t. a. line, but this is more often entirely lacking. The orbicular is seldom regular in shape, and varies from comparatively round to elongate oblique, in some of the latter shape almost touching the reniform.

169. *H. [Barnesii* Smith?]*]*—I am in doubt as to this species being *Barnesii*. It is certainly far from typical. I have three specimens in my collection from Banff, Alta., from Mr. Sanson, and have examined a number of others from that locality. It appears to me to be the same species as the specimen figured by Sir George Hampson from Colorado as *auranticolor*, but which was not the specimen labelled "type," though from the same locality, and which my notes tell me that I did not feel sure was the same species, wherein, however, I may have erred. It is a much more purplish-brown species than *Barnesii*, of which I have compared the types, and have now specimens from the type localities, Yellowstone Park, Wyo., and Glenwood Springs, Colo. This is placed by Hampson in *Trachea*, and next to *sora* Smith, which is probably a dark variation of it, as suggested by Dr. Dyar in the Kaslo List. One of the principal differences between *Parastichtis* and *Trachea*, as used by Hampson, is that the former has long and narrow primaries and the latter broad. Both this and the other slight differences of creasing and tufts mentioned seem to me sometimes variable in one species, e.g., *lignicolor*. In fact, I do not think the genera are very distinctly separated, or separable, though the characters may hold well enough for some of the species. My No. 169 varies considerably in wing form, and almost, though, so far as I have yet seen, not quite, connects with my co-type of *sora* in this character as well as in colour, they being not separable by maculation. Through *sora* the present species may show a specific relationship to *Barnesii*, but I must leave the matter as it stands at present. I have a specimen of this species from Peachland, B. C., and have one that is either this or *sora* (or both?) from Kaslo. Mr. Sanson's specimens were dated from July 30th to Aug. 14th.

(To be continued.)

A LIST OF DIPTERA TAKEN AT KEARNEY, ONTARIO, IN
JULY, 1909.

BY MILLARD C. VAN DUZEE, BUFFALO, N. Y.

The Diptera listed below were taken by me during a collecting trip to Kearney, July 2nd to 9th, 1909. As I had no thought at the time of publishing a list of the species taken, many of the common forms were not noted, but such unrecorded species are probably well known and widely distributed.

Kearney is located in the Parry Sound District, about fifty miles north of Muskoka, and as many miles east of Parry Sound. It is surrounded by low hills, from which most of the pine had been cut, the trees still standing being largely birch. In many places there was a thick growth of hazel and raspberry, and many *Cornus* bushes, which were in bloom at the time, were scattered over the low ground. There are well-tilled farms among the hills and along a valley through which a considerable stream flows, and near the town widens into almost a lake and receives several swampy creeks. There is, therefore, a great variety of conditions within a small area about Kearney, and I found it an excellent location for collecting insects.

I am greatly indebted to Prof. C. W. Johnson for the determination of a large number of the species enumerated in this list, and to Prof. J. M. Aldrich for his determination of *Dolichopidæ* and for his help and encouragement which has enabled me to determine some of these species myself. I also wish to acknowledge my indebtedness to Prof. James Hind, who kindly went over all the *Tabanidæ*, and to Dr. Johannsen and Dr. Williston for the study of material. Where not otherwise indicated, the species have been determined by myself.

The nomenclature here used follows the Aldrich Catalogue, except in a few cases, where the change is noted.

Family TIPULIDÆ.

- Rhipidia fidelis* O. S.
- Limnobia triocellata* O. S.
- Erioptera armata* O. S.
- Erioptera caloptera* Say.
- Liogma nodicornis* O. S.
- Bittacomorpha clavipes* Fabr.
- Oropeza venosa* Johnson.

Ctenophora apicata O. S.—I took one female flying by a roadside in a patch of swampy woods, and have since taken another specimen under similar conditions at Ridgeway, Ont.

Pachyrhina incurva Loew.

Family CHIRONOMIDÆ.

Palpomyia rufus Loew.—Det. Johnson.

Palpomyia trivialis Loew.—Det. Johnson. In the Aldrich Catalogue these two species are placed in *Ceratopogon*, but Johannsen refers them to *Palpomyia*.

Procladius caliginosus Johannsen.—Det. Johannsen.

Tanytus monilis Linn.—Det. Johnson.

Chosmatonotus unimaculatus Loew.—Det. Johnson. The White Mts., N. H., are given as the type locality of this species. I took several species at Kearney that were described from the White Mountain District.

Chironomus nigricans Johann.—There was but one specimen, a female, among the Kearney material, but probably it was a common species there. I have found it abundant at Toronto and about Buffalo.

Chironomus atrimanus Coq.

Metriocnemus par Johann.—I took one female that appears to be of this species, but the dark markings are of a very light brown. It seems to be immature, and measures but 4 mm.

Family CULICIDÆ.

Anopheles punctipennis Say.

Culex cantans Meig.

Culex sylvestris Theobald.

Family MYCETOPHILIDÆ.

Symmerus (Plesiostina) lauta Loew.

Apemone sp.—This may be *Platyura maudæ* Coq., but the abdomen is black, except that most of the third segment is reddish-yellow, otherwise it agrees well with the description of that species.

Mycomya mendax Johann.—My one female seems to agree well with the description of the female taken by Aldrich at Juliaetta, Idaho.

Family BIBIONIDÆ.

Bibio xanthopus Wied.—Det. Johnson.

Dilophus obesulus Loew.—Det. Johnson.

Dilophus sp.

Scatopse atrata Say.—Det. Johnson.

Family SIMULIIDÆ.

Simulium meridionale Riley.

Simulium venustum Say.—This species was very troublesome the first days of July.

Family RHYPHIDÆ.

Rhyphus fenestralis Scopoli.—Det. Johnson.

FAMILY STRATIOMYIDÆ.

Beris annulifera Bigot.—Det. Johnson.

Allognosta fuscitarsis Say.—Det. Johnson.

Actina viridis Say.—Det. Johnson.

Geosargus (Sargus) cuprarius Linn.—Det. Johnson.

Geosargus viridis Say.—Det. Johnson.

FAMILY TABANIDÆ.

[Prof. Hind determined or verified all the species in this family].

Chrysops mitis O. S.

Chrysops celer O. S.

Chrysops carbonarius Walker.

Chrysops cuclux Whitney.

Chrysops excitans Walker.

Chrysops frigidus O. S.

Chrysops striatus O. S.

Tabanus lasiophthalmus Macq.

Tabanus illotus O. S.

Tabanus epistates O. S.—Numbers of this species could always be found on the windows of the railway station.

Family LEPTIDÆ.

Xylomyia pallipes Loew.—Det. Johnson.

Leptis mystacea Macq.—Det. Johnson.

Leptis plumbea Say.—Det. Johnson.

Chrysospila quadrata Say.—Det. Johnson. Abundant in damp woods.

Family CYRTIDÆ.

Pterodontia flavipes Gray.—I took one specimen while beating low bushes on a hillside. I have another specimen taken by my brother, E. P. Van Duzee, on Mackinac Isd., Michigan, in July, 1910.

Family BOMBYLIIDÆ.

Spogostylum pluto Wied.—Det. Johnson. I saw quite a number on

the ground and on logs where there had been a bush fire a few weeks previous.

Anthrax morio Linn.—Det. Johnson. Common along paths and roads. Those taken vary from $4\frac{1}{2}$ mm. to 9 mm. in length.

Anthrax lepidota O. S.

Family THEREVIDÆ.

Thereva frontalis Say.—Det. Johnson.

Thereva nigra Say.—Det. Johnson.

Family ASILIDÆ.

Dasyllis grossa Fabr.

Dasyllis socratos Walker.

Dasyllis posticata Say.—Det. Johnson.

Dasyllis flavicollis Say.—Det. Johnson.

Laphria sericea Say.—Det. Johnson.

Laphria æatus Walker.—Det. Johnson.

Laphria sp.—Much like the preceding, but with a golden and black matrix.

Laphria pubescens Willist.—Det. Johnson.

Laphria canis Willist.—I found *Dasyllis* and *Laphria* much more abundant than they are about Buffalo.

Family DOLICHOPIDÆ.

Psilopodinus patibulatus Say.—Det. Johnson.

Psilopodinus scobinator Loew.—Det. Aldrich. This species was very abundant along the sunny edges of woods. There were great numbers of individuals of this family near the marshy borders of the streams, and I now regret that I was not more thorough in collecting them.

Chrysotus obliquus Loew.—Det. Aldrich. These were also abundant in sunny places.

Chrysotus affinis Loew.

Chrysotus chloricus Wheeler.

Chrysotus discolor Loew.

Argyra albicans Loew.—Det. Aldrich.

Neurigonia spp.—I sent two species belonging to this genus to Prof. Aldrich, and he reports that both are still undescribed.

Neurigonia rubella Loew.—One female seems to belong to this species.

Medeterus sp.—One female belonging to this genus I have not yet been able to determine.

Dolichopus calcaratus Aldr.—Quite abundant in places.

Dolichopus longimanus Loew.

Dolichopus palæstricus Loew.

Dolichopus batillifer Loew.

Dolichopus sp.—Prof. Aldrich determined this as No. 32 of his manuscript table of the species of *Dolichopus*.

Dolichopus splendidus Loew.—Det. Aldrich.

Dolichopus melanocerus Loew.

Dolichopus brevimanus Loew.

Dolichopus reflectus Aldr.

Dolichopus lobatus Loew.

Dolichopus discifer Stannius.

Dolichopus scoparius Loew.

Dolichopus chrysostoma Loew.

Gymnopternus frequens Loew.—Det. Aldrich.

Hercostomus unicolor Loew.—Det. Aldrich.

Paraclius claviculatus Loew.

Family EMPIDÆ.

Platypalpus flavirostris Loew.—Det. Johnson.

Synechus pusillus Loew.

Empis pallida Loew.—Det. Johnson.

Empis pæcilopectera Loew.

Rhamphomyia mutabilis Loew.—Det. Johnson.

Rhamphomyia basalis Loew.

Rhamphomyia hirtipes Loew.

Rhamphomyia pulla Loew.

Rhamphomyia minutus Walker?

Rhamphomyia luteiventris Loew.—Det. Johnson.

Family PLATYPEZIDÆ.

Platypeza velutina Loew.—Det. Johnson.

Family PIPUNCULIDÆ.

Pipunculus nitidiventris Loew.—Det. Johnson.

Family SYRPHIDÆ.

Microdon tristis Loew.—Two specimens were taken resting on leaves of hazel bushes.

Chrysogaster pulchella Willist.

Pipiza spp.—Two species were taken, one of which may be *puella* Willist., but I cannot be sure of the species belonging to this genus.

Paragus tibialis Fallen.

Melanostoma mellinum Linn.

Syrphus Americanus Wied.

Syrphus Lesueurii Macq.

Syrphus ribesii Linn.

Syrphus arcuatus Fallen.

Allograpta obliqua Say.—Quite abundant about meadows.

Mesogramma geminata Say.

Sphærophoria cylindrica Say.

Sphegina lobata Loew.

Sphegina Keeniana Willist.

Rhingia nasica Say.

Volucella evecta Walk.

Sericomymia bifasciata Willist.—Two specimens taken flying in the bright sunshine about the leaves of low weeds along the edge of a wood.

Sericomymia chalcopyga Loew.—One specimen was taken resting on a leaf in the woods.

Condidea lata Coq.—Det. Williston. Several were seen flying around and alighting on the wet ground along a roadside ditch in the woods, but their motions were so quick I was only able to capture one.

Helophilus grænlandicus O. S.—These were taken with the preceding. I also took one on stones in a running brook.

Syritta pipiens Linn.

Xylota ejuncida Say.—Det. Williston. Also taken by the side of the water.

Family CONOPIDÆ.

Zodion fulvifrons Say.—Det. Johnson.

Zodion nanellum Loew.—Det. Johnson.

Oncomymia abbreviata Loew.—Det. Johnson.

Myopa clausa Loew.—Det. Johnson.

Family TACHINIDÆ.

Macquartia pristis Walk.—Det. Johnson.

Ocyptera dorsiades Walk.—Det. Johnson.

Metachæta helymus Walk.

Peleteria tesellata Fabr.—Det. Johnson.

Archytas aterrima Desvoidy.—Det. Johnson.

Family MUSCIDÆ.

Morellia micans Macq.—Det. Johnson.

Family ANTHOMYIDÆ.

Mydæa nigripennis Zett.—Det. Johnson.

Spilogaster signia Walk.—Det. Johnson. I saw a number of these in the crevices of the rough bark of large trees.

Spilogaster nitens Stein.—Det. Johnson.

Spilogaster pagana Fabr.—Det. Johnson.

Limnophora diaphana Wied.—Det. Johnson. Taken resting on trunks of trees.

Phorbia latipennis Zett.—Det. Johnson.

Phorbia fuscipes Zett.—Det. Johnson.

Cænasia calopyga Loew.—Det. Johnson.

Family SCATOPHAGIDÆ.

Cordylura gracilipes Loew.—Det. Johnson.

Cordylura munda Loew.—Det. Johnson.

Cordylura setosa Loew.—Det. Johnson.

Parallelomma varipes Walk.—Det. Johnson.

Scatophaga furcata Say.—Det. Johnson.

Scatophaga pallida Walk.—Det. Johnson.

Scatophaga stercoraria Linn.—Det. Johnson.

Scatophaga suilla Fabr.—Det. Johnson.

Family HETERONEURIDÆ.

Clusia lateralis Walker.—Det. Johnson.

Family HELOMYZIDÆ.

Scoliocentra helvola Loew.—Det. Johnson.

Family SCIOMYZIDÆ.

Bischofia (Dryomyza) aristalis Coq.—Det. Johnson.

Neuroctena analis Fallen.—Det. Johnson.

Tetranocera plebeja Loew.—Det. Johnson.

Tetranocera valida Loew.—Det. Johnson.

Tetranocera plumosa Loew.—Det. Johnson.

Tetranocera combinata Loew.—Det. Johnson.

Tetranocera flavescens Loew.—Det. Johnson.

Tetranocera pallida Loew.—Det. Johnson.

Tetranocera saratogensis Fitch.—Det. Johnson.

Family SAPROMYZIDÆ.

Lauxania obscura Loew.—Det. Johnson.

Sapromyza vulgaris Fitch.—Det. Johnson.

Sapromyza bispina Loew.—Det. Johnson.

Sapromyza tompedita Loew.—Det. Johnson.

Sapromyza lupulina Fabr.—Det. Johnson.

Family ORTALIDÆ.

Melieria similis Loew.—Det. Johnson. This species was taken quite abundantly in the sweep-net from rank weeds growing by a swampy creek near the village.

Leoptera vibrans Loew.—Det. Johnson. These were always to be found on the windows of the railway station but none were taken elsewhere.

Family TRYPETIDÆ.

Rhagolitis fausta O. S.—Several specimens of this pretty species were taken from the sweep-net or found resting on the leaves of the rank vegetation on swampy ground. The larvæ live in cherries, but I did not notice any cherry trees near where they were taken, wild cherries, however, were common about Kearney.

Family MICROPEZIDÆ.

Calobata univitta Walk.—Det. Johnson.

Family SEPSIDÆ.

Sepsis violacea Meig.—Det. Johnson.

Nemopoda cylindrica Fabr.—Det. Johnson.

Family PSILIDÆ.

Chyliza apicalis Loew.—Det. Johnson.

Psila bicolor Meig.—Det. Johnson.

Family EPHYDRIDÆ.

Dichata caudata Fallen.—Det. Johnson.

Scatella stagnalis Fallen.—Det. Johnson.

Family OSCINIDÆ.

Oscinis coxendix Fitch.—Det. Johnson.

Chlorops crocota Loew.—Det. Johnson.

Family DROSOPHILIDÆ.

Drosophila funebris Fabr.—Det. Johnson.

The 181 species enumerated above represent 109 genera and 36 families.

NOTES OF CAPTURES OF LEPIDOPTERA AT SUGAR AND
LIGHT DURING 1910 AT MY FARM ON THE LONG
RIVER, NEAR CARTWRIGHT, SOUTHERN MANI-
TOBA, AND ALSO OF THE RESULTS OF
THE OVERHAULING OF SEVERAL
CASES OF DUPLICATES.

BY E. FIRMSTONE HEATH, CARTWRIGHT, MAN.

The collecting season of 1910 was in many respects so very peculiar that I think some description of it, and a fuller account of my captures than can be given in the very useful list annually compiled by Mr. Arthur Gibson may be interesting.

The snow was all gone by March 12th, and the brook which courses through my land was free from ice, but the weather during the rest of the month was cold and stormy, and nothing appeared on the wing.

For nearly all of the identifications I am indebted to Dr. J. B. Smith, and the numbers accompanying the names are those of Dr. Dyar's List of N. A. Lepidoptera, 1902.

April came in warmer, and on the 1st I took a single *Semioscopsis inornata* Wlsm. (5895) at light; and on the 2nd and 3rd a few *Homoglaea hircina* Morr. (2256) at sugar. The first *Pieris rapæ* Linn. (40) were seen on the 20th, after which they were very numerous, and I feared we were in for another dose like that of the previous year, when the cabbage plot had to be carefully gone over every morning, and as many as possible of the ovipositing females netted, in order to save my plants. Strange to say, in the fall the caterpillars gave very little trouble. Either the extremely hot and dry weather had in some way caused a failure of the spring brood, through scarcity of food-plant, or the contents of some parasitized pupæ I had sent in from Montreal had established themselves to some purpose. Up to the date on which I am writing (May 2nd) I have not seen a single *Pieris rapæ*, though hibernated specimens of other genera are to be frequently met with. The potato crop was seriously damaged by the Colorado beetles. In fact, the crop was almost a total failure from the drought, in addition to the beetle attack. It used to be said that the beetle could not survive the Manitoban winter, and in the early years of my potato growing it used only to appear in small numbers, and at intervals of several years. But now, owing, I am afraid, to the neglect of potato growers in destroying the larvæ whenever seen, no matter in how small a number, in these occasional appearances, it has become acclimatized, and is going to be very troublesome. I have several times during the last few years seen one of the Soldier Bugs,

July, 1911

Perilloides bioculatus Fab., devouring larvæ. Unfortunately, the bug is not sufficiently numerous to have much effect in reducing the numbers and the destruction done by the beetle.

The weather continued cold, with nightly frosts, till the 26th April, when a few Graphiphora and sundry hybernated noctuids came to sugar. On May 14th I took at sugar a couple of *Phæocyma unilineata* Grote (3000). It is always rare and of very irregular occurrence. Also some *P. norda* Sm., and one or two *P. minerea* Guen. (2990) and a single *Euchæa cretaceata* Pack. (3334).

On May 22nd a single *Xylina pexata* Grote (2112), very well preserved, was taken, making the third specimen in my collection.

The wild fruits, cherries, saskatoon and cultivated currants bloomed at the end of the month, but I took nothing worth recording, very few moths visiting the blossom.

June 9th.—The *Actonyctas* now began to appear, and this genus came out rather strongly during the season. During the next few evenings I took :

- | | | |
|----------|-------|---|
| | 990. | <i>Acronycta morula</i> , Grote. |
| | 982. | “ <i>leporina</i> , Linn. |
| | 988. | “ <i>innotata</i> , Guen. |
| | 999. | “ <i>Radcliffei</i> , Harv. |
| June 23— | 1001. | “ <i>spinigera</i> , Guen., one only. |
| | 29— | 1030. “ <i>noctivaga</i> , Grote. |
| | 1016. | “ <i>falcula</i> , Grote. |
| | 1038. | “ <i>emaculata</i> , Smith. |
| | 995. | <i>Acronycta telum</i> , Guen. Dr. Smith says this is the true <i>telum</i> described by Guenée. The more eastern variety, <i>hasta</i> , does not seem to occur here. It is not by any means abundant, and is difficult to separate when on the sugared trees from <i>A. Manitoba</i> Smith (996). |
| 27— | 993. | <i>Acronycta lobeliæ</i> , Guen. A couple for the first time. |
| Aug. 6— | | <i>Acronycta tartarea</i> , Smith. I also took one or two more during the latter part of the month, and September. I am afraid I have hitherto overlooked this moth. It was quite by accident I noticed its very dark secondaries, having before confused it with <i>A. revellata</i> . |
| 17— | | <i>Acronycta</i> ?, a couple, male and female, which Dr. Smith thinks are not described. |

- June 21—1579. *Euxoa plagigera*, Morr. One at sugar.
 23—1418. *Platagrotis pressa*, Grote. Several very good specimens.
 1419. “ *condita*, Guen. One or two.
 1415. *Adelphagrotis prasina*, Fabr. Scarce here.
 2772. *Meliopotis versabilis*, Harv. One, for the first time.
 1290. *Dipterygia scabriuscula*, Linn. One; the second I have taken.
 Hadena miniota, Smith. One; rare; easily confused with *devastatrix*.*
 24— *Homohadena fifia*, Dyar. Always rare here; one.
 27—2540. *Ogdoconta cinereola*, Guen. One; a rarity here.
 28— 919. *Halisidota tessellaris*, S. & A. Several. I have in previous years hardly seen this moth. This season it seems to have replaced *maculata* Harr. (922), which has been usually fairly common, both at sugar and light.
 Aplectoides fales, Smith. One, at sugar. This seems to be also a new species, which I do not find listed.†
 29—1504. *Noctua atricincta*, Smith. Rare; one, and a species of *Noctua* which Dr. Smith thinks may be new.
 1289. *Trachea delicata*, Grote. One, for the first time.
 July 10—1422. *Eueretagrotis sigmoides*, Guen. One. I have not taken this moth for several years.
 15—3066. *Bomolocha bijugalis*, Walk. A rarity here; one.
 18—1243. *Hadena cariosa*, Guen. One, for the first time.
 19—2159. *Gortyna velata*, Walk.
 23—1554. *Mamestra obesula*, Smith. One, for the first time.
 During June I took several *Chytonix*, which are either a curious variety of *palliatricula* Guen. (1067) or are a new species. They are at present in Dr. Smith's hands for examination. The ordinary form is common here.
 24—1269. *Polia extincta*, Smith. One, for the first time.
 30—1291. *Actinotia ramosula*, Guen. One, for the first time.
 31—1150. *Hadena transfrons*, Neum. Rare, but on this and subsequent nights I took two or three more.
 Aug. 2—1884. *Dargida procinctus*, Grote. One.

*Mr. Dod considers it a colour variation of *H. versuta*, see page 233.

†Jour. N. Y. Ent. Soc., XIII, 192, Dec., '05.—Ed.

- 4—656a. I took flying over some annuals in my garden a couple of *Hemaris thysbe*, var. *ruficaudis* Kirby, for the first time. In some years *thysbe* is numerous at wild plum and Carayana bloom, etc.
2230. *Agroperina helva*, Grote. Not common; occurs at intervals.
- 5—2189. *Papaipema circumlucens*, Smith. At light; in trap; one.
- 7—1697. *Euxoa dissona*, Mösch. One, at sugar. I think this makes the third I have taken during twenty-five years' collecting.
- 9—2568. *Rivula propinqualis*, Guen. The second I have taken.
- 11—1823. *Mamestra lilacina*, Harv. One or two particularly brilliantly marked, so much so that at first I thought it was another species.
- 18— *Euxoa indensa*, Smith. This new species seems to be almost equally numerous with *verticalis* Grote (2607a), a variety of which I have taken it to be.
- 31— Nothing came to my trap since the beginning of the month until this night, when I found a fresh *Papaipema nitela* Guen. (2179), and a few other things not worth recording.
- June, July and August were generally much hotter than usual, and the rainfall was very much below the average, hardly amounting to one-third of the normal.
- The autumn genera came out in very small numbers generally speaking. Perhaps *Calocampa*, *Glæa* and *Cosmia* were in their usual strength. Of *Peridroma*, *occulta* Linn (1462) was more numerous than usual, but *astricta* Morr. (1464) was absent. *Xylina* was very sparsely represented, and *Catocala* hardly at all. In some years I have counted 25 to 30 individuals of some half dozen species of the latter upon a single sugared tree, and in a clump of trees some fifty yards square I must have seen two or three hundred of them on some dozen tree trunks. Indeed they were rather a nuisance, driving away other things more desirable. This year I saw two or three of the commoner species in an evening at the most.

- Sept. 1—2161. *Gortyna velata*, Walk. In trap.
 2165. " *immanis*, Guen. In trap.
 2174. *Papaipema rigida*, Grote. In trap.
 2190. " *rutila*, Guen. In trap.
 2189. *Papaipema circumlucens*, Smith. In trap. One or two of each.
 5—2175. *Papaipema Harrisii*, Grote. In trap; one. This is the second I have taken.
 13—1610. *Euxoa citricolor*, Grote. At sugar; one. Very rare here.
 1147. *Hillia discinigra*, Walker. At sugar; one. It is only within the last year or two that I have taken this species.
 20—2185. *Papaipema unimoda*, Smith. In trap; one, for first time. During September I took several examples of *Tæniocampa communis*, Dyar.
 2021. *Graphiphora uniformis*, Smith.
 2026. " *peredia*, Grote. One or two.
 During October I got a few *Xylina ancilla* Smith; *Grotei* Riley (2092); *antennata* Walker (2090); *holocinerea* Smith (2193), and on
 Oct. 9— *Xylina laticinerea*, Grote (2091). This species very seldom occurs here, and this must be about its western limit. I do not think I have seen more than two or three in my years of collecting.
 14—2114. *Euharveya carbonaria*, Harv. One, for the first time. Dr. Smith kindly went through my old *Orthosia Conradi* series, and I find I have most of the new *Agroperina* species, viz.:
Agroperina inficita, Walker.
 2231. " *lutosa*, Andrews.
 " *lineosa*, Smith.
 " *pendina*, Smith.
 2229. " *Conradi*, Grote.
 I also found among some duplicates which I had not worked over,
 2104. *Xylina emarginata*, Smith. I took it early in the spring, so I conclude it is a hybernated specimen, but it is in good order.

1265. *Polia pulverulenta*, Smith. One.

I may mention here that the *Polias* I have hitherto sent to my friends as *confragosa* belong, Dr. Smith now says, to the *medialis-acutissima* species, the one being a variety of the other.

1650. *Euxoa incubata*, Smith. - One, the first taken.

In Sphingidæ, Bombyces, Geometridæ and Micros, I took practically nothing at all, owing, I suppose, to the unfavourable weather for collecting at lights.

GEOMETRIDÆ AS YET UNDESCRIBED.

BY RICHARD F. PEARSALL, BROOKLYN, N. Y.

Chlorosea Proutaria, n. sp.—Expanse, 32–34 mm. Antennæ bipectinate in ♂, serrate in ♀, white above, yellowish beneath. Front and vertex rosy white, the border of orbits and a line behind vertex in ♂ deep roseate. Wings of the same thin texture, size and shape as *Nevadaria* Pack, but the green of primaries is more intense, and the strigations of white a little more marked, especially in the ♂. An almost straight broad white line crosses primaries, starting from costa about one-fourth from apex, and sloping more strongly toward base, than does the same line in *Nevadaria*, reaches inner margin at centre. There can be traced a very faint suggestion of a narrow white basal line in both types, more evident in the ♂, one-fourth from base at costa, and rounding outward to same distance on inner margin. Secondaries in ♀ white silken, tinged at anal angle with green, and having marginal line of same colour; fringes short, WHITE. In ♂ they are white, centrally traversed by a white curved line, parallel to outer margin, not defined costally, quite evident at inner margin, where it curves strongly toward base. Within this line there is a thin dusting of green scales; outside it, they are heavily scattered, becoming intense and strigate toward anal angle; marginal line and fringes GREEN. Beneath all wings an even greenish white, the outer line of primaries showing through faintly. No discal dots above or below. Thorax and basal segments of abdomen above pea green, the latter white terminally and beneath. Body beneath white, washed heavily in front and faintly at sides with green. All legs with femora green, the front pair with tibiæ roseate, all others white; all tarsi white.

Types ♂ and ♀, the former taken at Chimney Gulch Golden, Col., VIII, 26, '04 (Osler), the latter at Eureka, Utah, V, 27, '10 (Spalding), in author's collection. In appearance much like *Nevadaria* Pack, but easily distinguished from it by the absence of red markings on abdomen.

July, 1911

In recognition of the many kindly services rendered to me and other co-workers in the group by Mr. Louis B. Prout, of London, Eng., I have given his name to this species.

Three co-type ♂♂s are in the author's collection from Golden and Clear Creek, Col.

Aplodes intensaria, n. sp.—Expanse, 25 mm. Palpi roseate, projecting beyond front in ♂, longer in ♀ and paler at tip. Antennæ yellowish, shortly bipectinate in ♂, simple in ♀. Front deep rosy pink; on vertex a pure white line between antennæ, with a narrow roseate line between this and collar, which is green. All wings above dark sea green, darker than any other species known to me, strigate with white, the primaries produced and sharp at apex. Costa above narrowly salmon pink its entire length, becoming roseate at apex. Two broad white firm lines cross each wing. On primaries, the inner about one-third out on costa, runs outwardly almost straight across to inner margin one-third out. The outer line, at costa two-thirds out, has a slight inward curve at centre of wing, reaching inner margin two-thirds out. Secondaries with anal angle slightly produced, the inner margin being long. Inner line close to base curves boldly outward reaching inner margin at same distance from base as at costa. Outer line two-thirds out, runs in a curve parallel to outer margin until it drops below cell, when it curves outward and downward to a point on inner margin much nearer anal angle than would have resulted from its original course. No marginal lines. Fringes cream white at base, rosy at margin. No discal dots above or below. Beneath evenly greenish white, the lines above showing through. Costa of primaries as above. Thorax above and beneath dark green. Abdomen above green, marked at base by a large roseate triangle enclosing a cream white blotch, the third, fourth and fifth segments with similar marks decreasing in size toward apex. Below green except just at base and tip, these being whitish. Legs cream white, all more or less washed with roseate, strongly on fore legs.

Types ♂ and ♀ taken at Eureka, Utah, (Spalding) V, 9, '10, and V, 13, 1910, respectively, are in author's collection.

Two co-type males from same locality, VIII, 6, 10, and V, 21, '10. Another specimen in collection of Brooklyn Institute Museum was referred to *Aplodes rubrifrontaria* Pack, Beaver Valley, Utah, June, in Science Bulletin No. 8, by the author, and bears a label by Mr. Grossbeck that a specimen like it is in the U. S. Nat. Museum at Washington as *festaria*

Hulst. The type of *festaria* Hulst is in the Am. Museum of Nat. History, N. Y. City, and is quite a different insect.

Nearest to *viridicaria* Hulst, but in that species the abdomen was white in the four examples from Colorado, which were his types. The "type" so labelled by Hulst in Bklyn. Inst. Museum is from Hot Springs, N. M., 7,000 ft. altitude, and belongs to another species.

Stamnodes affiliata, n. sp.—Expanse, 28–30 mm. Palpi long, stout, dark brown, last joint ochreous, tipped with roseate. Front and vertex rosy ochre; an irregular patch of black scales centrally, between antennæ, extending in a line down front. Antennæ rosy ochreous, irregularly mottled with black. Thorax and abdomen pale ochre, the former with a central longitudinal blackish streak, the latter having segments darkened anteriorly by heavy black atoms. All wings above, an even dark glossy plumbeous much like *Rickseckeri*, but darker. Broadly along costa on primaries, broken into irregularities by clusters of black scales, a band of rosy ochre extends to and expands over the apical and outer marginal areas. The basal portion of secondaries is frequently dusted with these scales, its outer boundary being the curiously broken transverse line beneath. Fringes rosy ochreous, cut with black at veins. No discal dots. A faint, broad, pale line, beginning at costa half way out, runs straight across wing, fading out at centre. This line can be traced in all the 17 examples before me, but often only by suggestion. Beneath, primaries as above, the rosy ochreous scales broadly covering costa, apex and outer margin to middle. Short strigate markings of black cover this rather thickly, more densely just outside the border of a narrow whitish (or clear white) line, starting from costa one-fifth from apex, running across it with a sharp outward trend to vein 8, thence inclined basally to vein 5, again sharply outward to vein 3, where it turns inward, becomes faint and runs parallel to outer margin to a point one-third within anal angle, at inner margin. No discal dots or marginal line. Secondaries from base to transverse line are evenly covered with roseate-ochreous strigate finely with black. Outer area, having similar ground colour, is much darkened to margin with black and plumbeous atoms and strigations, especially along outer border of line. This line, leaving costa a little more than half way from base, makes a strong outward scollop to vein 5, then with an abrupt outward sweep or angle, makes a second long scollop to inner margin, well within anal angle. One or two highly coloured examples

have a bright chestnut red patch outside angle of line at costa on primaries, and on secondaries at both ends of the line, rather broadly diffused. Discal dots large, round, black. Fringes of plumbeous and ochreous scales mixed, flecked with black atoms. Thorax and abdomen beneath dark brown. Legs ochreous, heavily dusted with dark brown and roseate scales.

Types six males and one female, taken at San Diego, Calif., XI, 16, to XII, 9, 1910 (Ricksecker), with ten co-types in author's collection.

(To be continued.)

DR. SAMUEL HUBBARD SCUDDER.

After many years of patiently endured weakness and infirmity, which affected his bodily powers but left his mental capacity unimpaired, the end has at length come to a most distinguished Entomologist, Dr. Samuel Hubbard Scudder, who died at his residence in Cambridge, Mass., on the 17th of May, 1911, aged 74 years. Dr. Scudder was born in Boston, and received his education at Williams College, where he took the degree of A. B. in 1857; five years later he became a B. S. of Harvard University. In 1890 he received the honorary degrees of Doctor of Science at Williams and LL.D. at Pittsburgh. A lover of Nature from his earliest years, he devoted his life to the study of the insect world, and at the same time did not neglect the refining cultivation of music and literature. His charm of manner, kindness of thought, entire unselfishness, refinement and courtesy, attracted to him the friendship of the leaders in science, art and literature in that centre of culture where he lived. He was also considerate and sympathetic with the poor and struggling students of nature and the aspiring entomologists, however uncouth they might be, winning their hearts' devotion and life-long admiration and respect. A loveable man indeed, and a trusty friend to those who knew him well. When the writer first came within the charmed circle, of which Dr. Scudder was the centre, some forty years ago, he and his young wife were living in Cambridge. Not long after, on account of her delicate health, they went to the south of France, and enjoyed for a time the balmy climate of the Riviéra; but health was not restored, and soon the 'much loved wife was taken away. Years after he experienced another bitter sorrow in the death of his only child, who had entered upon a physician's career with every prospect of attaining distinction in medical science. Over devotion to the needs and calls of the sick in a time of severe epidemic in Boston, led

to his untimely death, and left the father sadly forlorn. Apart from these two bereavements, his life was cheerful and happy, and it was a rare delight to spend an hour or two in the quaint little building behind his dwelling, where were stored his rich treasures of butterflies, locusts and fossils, and his library of scientific works.

After spending fully twenty-five years in the study of the life-history of butterflies and the collection of information from all quarters, Dr. Scudder produced his first great work "The Butterflies of the Eastern United States and Canada," three large royal octavo volumes, illustrated with a wealth of plates and maps, showing the insects in all stages in their natural colours, and giving details of structure as well. From time to time he published single small volumes on Butterflies adapted to the needs of the ordinary collector, and leading on to scientific study. From the butterflies he turned to the Orthoptera, and published a number of books and articles of a systematic character, which are a great help to students of this order. His attention was next directed to fossil insects, of which he formed a most interesting collection, resulting in the publication of his splendid work on the Pre-tertiary and Tertiary Fossil Insects of North America. A full bibliography of Dr. Scudder's works will no doubt soon be prepared, and will fill many pages.

The high scientific reputation which he enjoyed is abundantly evident from his election to honorary membership in important societies in London, Vienna, St. Petersburg, Moscow, Brussels, the Hague, Geneva, Madrid, Argentina, as well as many in North America. He was one of the first honorary members of the Entomological Society of Ontario, being elected in 1868, and a frequent contributor to the pages of the CANADIAN ENTOMOLOGIST, as well as occasionally to our Annual Reports.

C. J. S. B.

SPHÆRIDIDIUM BIPUSTULATUS FAB. FOUND IN THE
NEIGHBOURHOOD OF NEW YORK CITY

BY CHARLES SCHAEFFER.,

Museum of the Brooklyn Institute, Brooklyn, N. Y.

Mr. Ernest Shoemaker showed me at the last meeting of the New York Entomological Society a few specimens of a small *Sphærididium* which he had taken in East New York, Long Island, in company with *S. scarabæoides*.

These specimens proved to be the European *S. bipustulatus* Fab., which differs principally from *scarabæoides* in smaller size and having the

hind angles of the prothorax acute, while in *scarabæoides* they are obtuse. They are generally not as brightly coloured as *scarabæoides*, though some of the varieties approach certain varieties of *scarabæoides*.

The colour is black ; prothorax and elytra generally with testaceous margin. Elytra near apex with a variable, transverse reddish-yellow fascia across suture of irregular outline and sometimes with a red humeral spot.

The transverse sub-apical fascia is sometimes very indistinct and often absent.

GEOMETRID NOTES.

A NEW EUPITHECIA.

BY L. W. SWETT, BOSTON, MASS.

Eupithecia Chagnoni, nov. sp.

Expanse 22 mm. Palpi long. Head white or grayish between antennæ. Wings light reddish ash in colour, darker towards outer margins. Fore wings light ash, with reddish brown shadings. Basal band narrow and black at costa about 2 mm. from body, whence it is curved back to base. Between the basal line and intradiscal are a few dashes. The intradiscal line is represented on costa by quite a large triangular patch bent towards discal spot, and from this patch runs a fine line accentuated on the veins to inner margin. Then a clear mesial space, in which the black discal spot stands out; beyond on costa the extradiscal line is also represented by a triangular patch, from which a hair line bends outward opposite discal spot, then inward scalloped on every vein to inner margin. Beyond extradiscal line is a pale band, following the same course about 1 mm. wide, with a black hair line running through it to inner margin. Beyond this for 3 or 4 mm. the wing is shaded heavily with reddish brown, with a trace of a faint, light, irregular line running to inner margin. The fringe is quite long and grayish, with intervenular dots.

The hind wings are full and rounded, as are the fore wings, and of the same colour, only darker. Several faint wavy lines may be discerned running across the wings below discal spot, which is round and black. Beneath, fore wings as above, only the extradiscal is wider and blacker, and the pale band beyond is clearer than above ; discal spots show on all wings. Hind wings, three prominent wide dark bands on basal and two beyond discal spot, which are slightly bent outward opposite discal spot. This is a very distinct species and not easily confounded with any other ;

July, 1911

it belongs to the *Russeliata*, *Brauneata* Swett group, and slightly resembles the former. I take pleasure in naming this after my kind friend, Mr. G. Chagnon, through whose courtesy I have had the privilege of examining many Canadian Geometrids.

Type, 1 ♂, 22, VI, 1907, Montreal, Que., in my collection. Co-type, 1 ♂, Montreal, Que., in Mr. Chagnon's collection.

BOOK NOTICE.

NATURE SKETCHES IN TEMPERATE AMERICA: By Joseph Lane Hancock, M. D., F. E. S. A. C. McClurg & Co., Chicago. Price, \$2.75.

This work is creditable both to the author and to the publishing house that has brought it out in so attractive a form.

It is a book that the public school teacher, in whose curriculum nature studies have a place, will gladly welcome. It will be found by such an one to be not only a store of information, but also a guide to investigations on his own part—it is both instructive and suggestive.

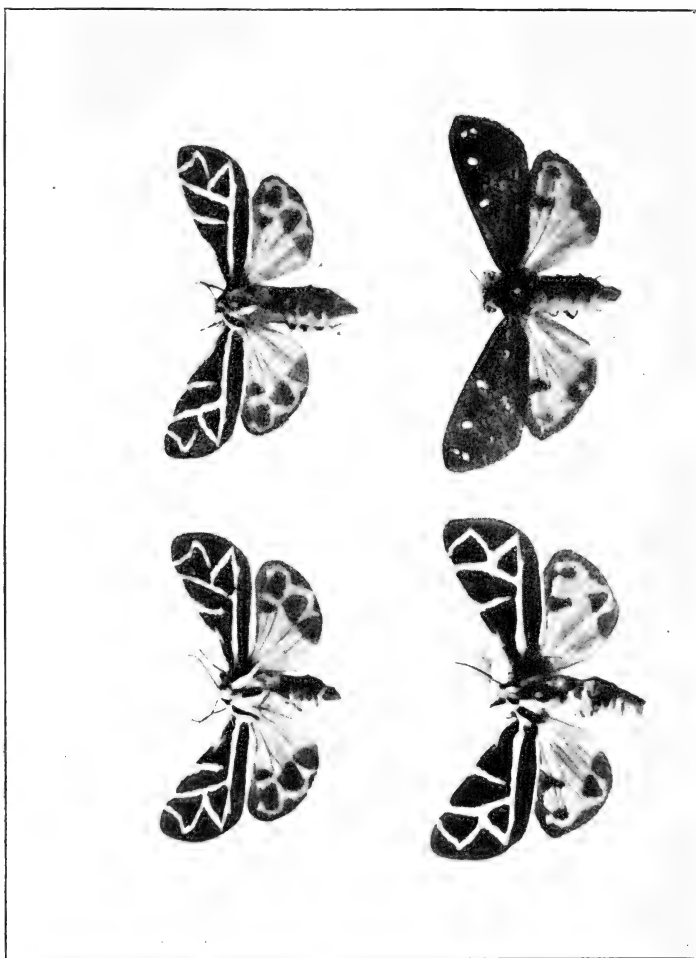
By city people, taking their families to the country for the summer vacations, the book will be found a treasure, affording pleasant reading for dull days, kindling in the minds of the young people an interest in the operations of nature, making known the life-histories of many living things.

With what eagerness the children will listen to the tragedies of the mouse in the wren's nest, the oriole hanged by a thread from its nest, the golden-crowned kinglet held in the grip of the burdock; with what pleasure they will hear of the rescue of the family of wrens, the deliverance of the song-sparrow from the blue racer, the successful taking of the photograph of the field sparrow, etc., etc. The book is full of delightful anecdotes; and the interest in it is greatly enhanced by the vignettes, tail-pieces and other cuts, to the number of two hundred and fifteen, and by the twelve coloured plates that adorn it. It may be highly recommended; it should have a place in every school library; it would be a charming gift for a boy or girl; it is well worthy the perusal of every lover of nature.

T. W. F.

Mailed July 3rd, 1911.





SPECIES OF APANTESIS.

UPPER ROW—*A. phyllira* Dru., male and female. LOWER ROW—*A. placencia* A. & S., male and female.

The Canadian Entomologist.

VOL. XLIII.

LONDON, AUGUST, 1911.

No. 8

NOTES ON TWO SPECIES OF APANTESIS.

BY WM. BARNES, M. D., AND J. MCDUNNOUGH, PH. D.

During March and April of this year we received from N. Carolina a number of Arctian larvæ found on lupine which could at once be recognized as representing two distinct species. The larger, and seemingly rarer of the two, was entirely-velvety black with a broken orange-red dorsal stripe, which showed in some cases a great tendency to become obsolete. It seemed most closely to agree with Abbott and Smith's figure of the larva of *A. placentia*. A reference to the literature on the subject, however, failed to clear up our doubts; Dyar, in the Journal N.Y. Ent. Soc., VIII, 42, remarks that this figure has never been verified and that no description of the larva is extant, and our search through the later literature failed to give any further data. Nothing, therefore, remained but to let Nature take its course, and to await the emergence of the imago to settle the question. The larvæ fed up well on dandelion and pupated at long intervals under a slight web on the surface of the cage. The first specimen to emerge proved a great surprise; it was a splendid male, but instead of having the fore-wings black, with several white spots, as in Abbott's figure of *placentia*, our specimen showed a very close resemblance to what we have always considered to be *phyllira*. In the course of a couple of weeks two more males similar in every particular had emerged, and we began to have wild dreams of a possible new species.

In the meantime our other group had reached maturity and pupated; they were considerably smaller and could at once be separated from the first mentioned larvæ by the fact that the tubercles were nearly all prominently tipped with ochreous, the spiracles were light orange, instead of black, and the dorsal stripe was usually broad, continuous, and creamy yellow, instead of orange-red; this latter feature, however, showed considerable variation, some of our larvæ having a much broken and reduced stripe. As these larvæ agreed fairly well with Abbott and Smith's figure of *phyllira* larva, and with Packard's description of same (Jour. N. Y. Ent. Soc., III, 178), as far as could be judged, we awaited with a good deal of impatience the first imagines, in order to carefully compare the

two species. The first specimen to emerge, a male, proved to be an almost exact counterpart of the right-hand side of Drury's figure of *phyllira* (both sides are not similar), and we had no hesitation in identifying it as such. Compared with our first species, we could note following differences: (1) in species No. 1 the medial band of primaries is distinctly outwardly oblique, being much closer to the postmedial band on the inner margin than on the costal edge; in *phyllira* the two bands, when present (the medial band is often absent), are practically parallel; (2) in species No. 1 the underside of abdomen and the anal tuft are entirely black, in *phyllira* the anal tuft is bordered with cream and the underside is creamy, with two rows of black dots. Using these differences as a basis of separation, we examined the series of specimens already in the collection of Dr. Barnes under the name of *phyllira* and were able to separate out a series of each; of *phyllira* both males and females were represented; of our species No. 1, however, we noted that only males were forthcoming, when, in addition, a survey of the series of *placentia* brought to light the fact that it consisted entirely of females, we began to "smell a rat" and remember that such a factor as sexual dimorphism must always be reckoned with. In neither of the latest works on the subject (Neumögen & Dyar Revision of Bombycid Moths, Hampson Cat. Lep. Phal., III), could we obtain any information; both authors describe *placentia* according to Abbott's figure; in fact Hampson seems to have confused the two males under the name *phyllira*, for he notes under this species that the abdomen is black beneath, a statement that does *not* hold for the true species. At last, in Stretch's plates of Arctiidæ, recently published in the Jour. N. Y. Ent. Society, we came across a figure of *placentia* male, which exactly agreed with our species No. 1; others before ourselves had evidently arrived at the same conclusion; as, however, no text had been published to the figures, we were unable to determine whether the grounds for such a conclusion were sufficient; a few days later a freshly emerged typical female *placentia* in our breeding cage removed the last remnants of doubt we may have had, and proved conclusively that *placentia* shows a marked sexual difference. How far this fact is generally known we are unable to determine; we know, however, of no published statement concerning this variation, and trust that our remarks on the subject will not be entirely without interest. A reference to the accompanying plate will show more clearly than we can explain the points of similarity and difference between the species. We have been successful in obtaining two pairings of *A. phyllira* and the

young larvæ have already emerged ; we have also hopes of securing a pairing of *placentia* ; in any case, we have received a living female of this species from S. Carolina, which has already deposited several hundred ova.

If we succeed in breeding these species, we hope later to publish the full life histories. For the present, we append at the conclusion of this paper a more detailed description of the final stages of *placentia* and *phyllira* than given above.

As to whether *phyllira* is specifically distinct from *rectilinea* we are at present unable to judge ; there seem to be certain points of difference between our description of mature *phyllira* and Mr. A. Gibson's of *rectilinea* (CAN. ENT., XXXV, 117); this may, however, be merely due to the different modes of expression used ; we would be very pleased to receive eggs of the true *rectilinea* in order to try and settle the question by breeding.

Apantesis placentia (mature larva).

Head black, palpi and mouth parts slightly flesh-coloured ; body velvety black, occasionally somewhat marbled with light gray ; tubercles, entirely black, with the exception of I very large, rather conical from an irregular quadrate base, shiny, with bunches of stiff, black setæ, which show but few traces of spines ; a broken orange-red dorsal stripe, rarely present on the thoracic segments, and often almost entirely lacking ; spiracle black ; prolegs reddish-pink, with a few scattered black setæ.

Length, $1\frac{1}{2}$ -2 in.

A. phyllira (mature larva).

Head black ; base of palpi ochreous to reddish orange ; body black, more or less strongly marbled with dark gray, often leaving portions of the ground colour showing as subdorsal black stripe just below tubercle II ; laterally and ventrally lighter, due largely to increase of marbling ; tubercles, especially laterally, more or less strongly tipped with pale orange or ochreous, the base remaining largely black ; tubercle I very minute ; others large, more regularly rounded than in *placentia*, with bunches of stiff, black, strongly barbed setæ, which show a tendency to become whitish laterally ; a prominent dorsal stripe, narrow on anterior portion of segment, broadening out behind tubercle I, varying in colour from creamy to orange yellow, occasionally reduced to a series of dorsal spots ; spiracle narrowly oval, orange ; legs black, sometimes white-striped ; prolegs orange-yellow.

Length, $1\frac{1}{4}$ - $1\frac{1}{2}$ in.

NOTES ON MYRIOPODS FROM ALASKA AND WASHINGTON

BY RALPH V. CHAMBERLIN, PROVO, UTAH.

Through the courtesy of Prof. Harold Heath and Dr. E. Bergroth, I have received for study two small collections of myriopods from Alaska and the State of Washington. The material received from Prof. Heath was collected on St. Paul Island, Alaska, during the summer of 1910. The specimens sent by Dr. Bergroth were taken by him several years ago at Snettisham, Alaska, and Bremerton and Madison, Washington.

1. *Lithobius sulcipes* Stuxberg.

Two females and a male from St. Paul Island, Alaska.

It is doubtful whether *L. stejnegeri* Bollman can be maintained as a species distinct from this one. *L. arcticus* Attems, described from Behring Island, whence Bollman's types also came, is likewise very close to and probably not different from the form described as *stejnegeri*. In the description of *L. stejnegeri*, as published in the Bull. U. S. Nat. Mus., No. 46, p. 200, the spines of the anal legs are given as 1, 3, 2, 6; but there seems little reason to doubt that the 6 is here a misprint for 0, and consequently that Attems's stated ground for separating his *arcticus* is fictitious. The claw of the female gonopods varies from practically entire, as stated by Stuxberg for *sulcipes* and by Attems for some specimens of *arcticus*, to trilobed, as in the types of *stejnegeri* and part of the specimens upon which *arcticus* was based.

2. *Lithobius iginus* Chamberlin.

1911.—*Lithobius iginus*, Proc. Acad. Sci. Phil.

Several specimens from Madison, Washington.

3. *Geophilus glyptus* Chamberlin.

1902.—*Geophilus glyptus*, American Naturalist, p. 477.

One specimen from Madison, Wash., fully agreeing with type.

4. *Geophilus glaber* Bollman.

1889.—*Geophilus glaber*, Entom. Americana, 88, p. 229.

Two specimens from Bremerton, Wash.

5. *Linotenis chionophila* (Wood).

1814?—*Geophilus acuminatus* Leach, Trans. Linn. Soc. Lond., XI, p. 386.

1862.—*Strigamia chionophila*, Journ. Phil. Acad., V, p. 50.

1909.—*Scolioplanes acuminatus* Attems, Arkiv. för Zoologi, V, No.

3, p. 25.

August, 1911

A male and a female from Snettisham (Bergroth), and twenty-two females and twenty-nine males from St. Paul Island (Heath).

Specimens of the present species studied by Attems from Behring Island are said by him to be identical with the European *L. acuminatus*, excepting in the larger number of legs, and they are accordingly listed under this name. A specimen from the same island is listed by Bollman as *L. chionophila*, and specimens from Popof and Kodiak Islands and from Sitka and Lower Inlet are likewise identified by Cook. There is no room for doubt that this northern form is the typical *chionophila* of Dr. Wood, whose original specimen, a female, was taken at Fort Simpson, on the Red River of the North; but if Attems is right in his identification, as he most likely is, the name *attenuatus* will have to be used. In view of the different mode in pairs of legs, and a few other points, however, it seems best to keep Wood's designation for the present and until the forms have been better studied as to distribution and variation.

Of the 22 females from St. Paul Island, 16 have 45 pairs of legs and 6 have 43. The female from Snettisham has 45. Wood's type has 43. Of the 29 males from St. Paul Island, 27 have 43 pairs of legs, one has 45 pairs, and one has but 41 pairs. The male from Snettisham has 43 pairs. Attems states that among his specimens from Behring Island one male had 41 pairs and one 45 pairs of legs, the others having 43; while but one female had 43 pairs of legs, the others having 45. Thus it would seem that the number of pairs in the male is almost constant at 43, individuals with 41 and 45 being occasional; while in the female the typical number is 45, variation to 43 being frequent.

In the case of European specimens of *L. attenuatus*, the number of pairs of legs is nearly always smaller. In Austria-Hungary Latzel found among 60 specimens studied that all the males had 39 pairs of legs; while in the females the number was either 41 or 43. Meinert similarly gives the number of pairs of legs in the male as constantly 41, but gives the number in the female as 41 or 47 pairs, one specimen having the latter number. In Die "Myriopoden Steiermarks," Attems states that all the males studied by him from that country had 39 pairs of legs, excepting one, which had 41, while all the females had 41. The same author, however, found among specimens from Transylvania four males with 37, two males with 35 and five males with but 33 pairs of legs; and of females, nine with 39, one with 37, and seven with but 33 pairs of legs. It will be seen, then, that in European specimens of *L. attenuatus* the typical number of pairs of legs in the male is 39, and that in some parts this number seems to be fixed, or nearly so; but that in other sections variation below

this number may be frequent or the rule. Similarly the typical number for the female is 41, but variation is more frequent than in the male, the number sometimes being 43, or, in sections where the variation in the number in the male in the minus direction is frequent, falling to 37, and even to 33. Neither males nor females with 35 pairs of legs have been reported.

In the United States the form commonly referred to *L. chionophila* differs from the northern specimens and agrees with the European *L. attenuatus* in having the number of pairs of legs in the male practically fixed at 39. In the female the number varies from 41 to 37. Of 22 females from Ithaca, N. Y., the author finds six to have 41 pairs, eight to have 39 and eight to have 37 pairs.

It may be added that the number of coxal pores in specimens of the European *attenuatus* and in the form of *chionophila* found in the United States averages considerably higher than in the Alaskan specimens here listed. Of the 22 females from St. Paul Island, eight have six pores, five have five, five have seven, three have eight and one has nine; of the males, sixteen have six pores, ten have five, two have seven and one has eight. The mode is thus six pores on each side.

6. *Hypozoneum anurum* Cook.

1904.—*Hypozoneum anurum*, Harriman Alaskan Expedition, I, p. 63.

One specimen from Bremerton, Washington. The type was taken at Seattle in the same State.

7. *Paraiulus furcifer* (Harger).

1872.—*Iulus furcifer*, Amer. Jour. Sci. and Arts, IV, p. 119.

A number of specimens from Bremerton, Washington.

This is a very common species throughout the Pacific Coast region, from Southern California to Canada.

8. *Paraiulus alaskanus* Cook.

1904.—*Paraiulus alaskanus*, Harriman Alaskan Exped., IV, p. 70.

Five specimens from Snettisham, Alaska.

Previously known from Juneau, Sitka, and Yakutat Bay.

9. *Scytonotus Bergrothi*, sp. nov.

Dorsum dark brown, the prozonites often paler, light brown; a narrow dark median longitudinal line, which is usually obscure over the anterior region, but more distinct over the median and posterior segments; carinae light brown. Venter light brown. Legs light brown proximally, darker and often of reddish tinge distad. Frontal and clypeal region of the

head pale brown or yellowish, with a dark area ventrad of the base of each antenna, and with less deep mottlings elsewhere, part of which border and delimit a narrow median pale stripe. Antennæ brown, with the last two articles commonly darker.

In the female the body is narrowed from the posterior region, cephalad to the sixth and seventh segments, where it is narrowest, again widening from there to the head. In the male the body is narrowed, both caudad and cephalad, from the middle region.

A sharply impressed median longitudinal line extends about half way across the vertex; from its anterior end two less sharply impressed lines diverge forward and outward, one running to the socket of each antenna. Vertes granulate. Frons and clypeus clothed with rather short setose hairs of uniform length.

Antennæ long; clavate, the penult article large; subdensely hirsute.

First dorsal plate clearly narrower than the head, inclusive of genæ. Anterior margin semi-circular; from each carina the margin runs caudo-mesad in a straight line to the mesal transverse portion, which is straight. An impressed line or sulcus parallel with the anterior margin and behind the first row of tubercles. Depressed along the median longitudinal line. Carinal and caudo-lateral borders distinctly margined. Tubercles strongly developed; arranged in about eight transverse rows. Carinæ each incised, producing two blunt teeth, of which the caudal is the larger; on the margin cephalad of the anterior one a number of much smaller denticulations, some of which become obscure.

Second dorsal plate with the lateral portions bent strongly cephalad; but remaining free from the first plate. Cephalo-lateral angle rectangular in outline, but well rounded; on its anterior or antero-mesal side a minute or almost obscure denticulation, and just caudad on the lateral margin a distinct acute tooth, which is succeeded by five others, which become wider and lower in going caudad on the lateral margin, and three low teeth or crenations on the caudal margin. Carinæ sub-horizontal or a little elevated, the intercarinal portion of segment, as in subsequent metameres, strongly convex. Tubercles on all segments strongly and distinctly developed. Transverse sulcus distinct over the median portion.

Third dorsal plate very similar to the second, less strongly bent forward at the sides. Carinal margin a little shorter. Teeth very similar, but the anterior denticulations more distinct, and those of the caudal margin more strongly developed.

Fourth dorsal plate like the third; but the carinal margin longer and the teeth of the caudal margin still more strongly developed.

On the subsequent plates the entire carinal margin presents about twelve distinct teeth. In preceding caudad the caudo-lateral angles of the carinae become first more and more rectangular, and then more and more distinctly produced caudad as usual.

Anal scutum with conical setigerous tubercles well developed; arranged in transverse rows. Each lateral margin with about seven distinct serrations. Apical process rounded distally; not decurved.

Anal valves smooth; mesal edges strongly margined. Lateral margins widely convex.

Anal scale with the lateral margins incurved. Caudal margin deeply, concavely excised, leaving at each lateral angle an acute conical projection.

Sterna with both longitudinal and transverse sulci distinct, the longitudinal one more sharply impressed.

Legs of median length; hirsute. In the male the second pair of legs of the ninth segment have a conspicuous, flattened appendage extending dorso-caudad from the distal end of the penult joint. Similar processes are present on both pairs of legs of the succeeding three segments, but the

processes become progressively smaller on the legs of the thirteenth segment, being obscure or absent as such.

The gonopods of the male of the general form typical for the genus, but differing in details from those of the previously described species. (See fig. 16.)

Length, 17 mm.; width, 2.3-2.4 mm.

Locality.—Bremerton, Wash.

Five specimens collected by Dr. Bergroth, after whom the species is named.



FIG 16.—*Scylonotus Bergrothi*, sp. nov.—Gonopods of the male seen in caudo-ventral aspect.

10. *Polydesmus bonikus* Chamberlin.

1911.—*Polydesmus bonikus*, Proc. Acad. Sci. Phil.

One specimen from Madison, Wash.

11. *Leptodesmus armatus* (Harger).

1872 — *Polydesmus armatus*, Amer. Jour. Sci., 3rd ser., Vol. IV, p. 118.

A number of specimens from Madison, Wash.

TACHINIDÆ, NEW AND OLD.

W. R. THOMPSON, ITHACA, N. Y.

In the following paper are included the descriptions of two new species of Tachinidæ and some miscellaneous observations upon several described genera and species. I wish to acknowledge gratefully my indebtedness to Miss A. C. Stryke, of the Department of Entomology of Cornell University, for help with the drawing of the head of *Schizotachina vitinervis*; to Dr. A. D. MacGillivray, who suggested the method of preparing accurate figures of the wings, and very patiently went over the paper with me, offering a great many useful suggestions for its improvement; and to Dr. D. W. Coquillett, who helped me out at several difficult points, and offered much valuable advice and criticism.

Linnæmya Desv. and *Bonnetia* Desv.

Bezzi and Stein, in their Katalog der Paläartischen Dipteren, have recognized the two genera, *Linnæmya* and *Micropalpis*. They include in the genus *Linnæmya*, *comta* Fall., and two other species. They include in the genus *Micropalpis* *hæmorrhoidalis* Fall., *vulpinus* Fall., and several other species. They apparently have overlooked the fact that Desvoidy had designated *siivestris*, a new species described by him, and now known to be the same as *vulpinus* Fall., as the type of *Linnæmya*. They were evidently also unaware of the fact that *comta* had been designated by Westwood as the type of *Micropalpis*. In other words, they have included under the generic name *Linnæmya*, the type of the genus *Micropalpis*, and under *Micropalpis* they have included the type and species belonging to the genus *Linnæmya*. *Micropalpis* was described by Macquart in 1834. The genus *Bonnetia*, described by Desvoidy in 1830, also has as type *comta* Fall., so that *Micropalpis* Macq. becomes, therefore, a synonym of *Bonnetia* Desvoidy. Mr. Coquillett has pointed this out in his paper, "The Type Species of North American Genera of Diptera."

As I have not had at my disposal specimens of many of the European species included in these two genera, nor even satisfactory descriptions of all of them, I cannot definitely say what characters have been used for their separation. So far as I can gather, *Linnæmya* includes only forms like *hæmorrhoidalis* Fall., in which only the females possess orbital bristles, while under *Bonnetia* are placed those species of which both sexes have orbital bristles. The North American representatives of the genera, including the new species of *Linnæmya* described below, may be separated as follows:

August, 1911

- Cheeks bearing black bristly hairs or macrochætæ at middle ; males without orbital bristles *Linnæmya* Desv.
 Cheeks without black bristly hairs or macrochætæ at middle, with only silky, yellow pile ; males with two pairs of orbital bristles *Bonnetia* Desv.

The presence of a delicate yellow pubescence on the parafacials in *B. comta* is another character which distinguishes it from the two North American species of *Linnæmya* ; in rubbed specimens, however, this pubescence is sometimes very difficult to discern. In *comta* the palpi are very small, and often partially covered by the folds of the proboscis so that only their tips are visible. The palpi of *hæmorrhoidalis* are much larger, and, in comparison with those of *comta*, quite well developed, while the palpi of the new species described below are somewhat intermediate in development between those of *hæmorrhoidalis* and *comta*. The American species of *Linnæmya* may be readily separated as follows :

- Postacrostichal bristles in three pairs ; sternopleural bristles three ; thorax and abdomen black, covered with grayish pollen, with darker reflecting spots *hæmorrhoidalis* Fall.
 Postacrostichal bristles in one pair ; sternopleural bristles four ; thorax and abdomen coal black, polished, very thinly grayish dusted *anthracina*, n. sp.

L. hæmorrhoidalis is the species referred to in Mr. Coquillett's "Revision," p. 87, under the name *picta* Meig. The latter species is now considered by European authors to be a synonym of *hæmorrhoidalis*.

Linnæmya anthracina, n. sp.

Thorax, legs and abdomen black, polished, very thinly dusted with whitish pollen, the apical half of the scutellum and a small spot on the side of the second abdominal segment in the male red ; calypteres deep yellow.

Front in male about two-thirds, in female about five-sixths as wide as the eye, frontal vitta dark brown, thinly dusted with whitish pollen ; face and front black, in the male silvery-gray pollinose, in the female the pollen present on the parafrontals only on a small space above the base of the antennæ, and as a narrow strip along the margin of the eye, fading out opposite the apex of the ocellar triangle, remainder of the parafrontals polished black ; frontal bristles descending nearly to the apex of the second antennal segment, only a few fine hairs outside the frontal row in the male, in the female type three strong orbital bristles on one side, and

two, separated by a wide space, on the other; antennæ reaching at least three-quarters of the distance to the oral margin, black, including the arista, and thinly dusted with whitish pollen; second segment slightly shorter than the third; arista thickened on the basal three-fourths, its second segment a little over twice as long as wide; parafacials and cheeks thickly, the facial plate and occiput rather thinly silvery-gray pollinose, cheeks below the end of the eyes and the extreme edge of the oral margin tinged with reddish; vibrissæ situated well above the oral margin, which projects beyond the vibrissal angles for a distance greater than half the length of the second antennal segment; oral margin caudad of the vibrissæ, with a row of strong macrochætæ, facial ridges bristly on the lower fifth; width of cheeks equal to about one-half of the height of the eye, cheeks with black bristles and bristly hairs at middle; palpi small, in female type not much longer than, in male co-type about twice as long as, the greatest diameter of the mediproboscis, their surface black, thinly whitish-dusted.

Mesonotum black, appearing when viewed from above polished, appearing thinly dusted with grayish pollen when viewed from behind; pollen becoming more dense anteriorly and upon the humeri; anterior part of the mesonotum indistinctly vittate; pleura very thinly whitish-dusted; four sternopleural bristles, formula 1: 2: 1, three pairs of postsutural and but one pair of postacrostichal bristles; scutellum polished, with rather more than the apical half red, the remainder blackish, three strong marginal, a pair of weak discal, and a pair of cruciate apical macrochætæ, the latter backwardly directed; legs black, polished, thinly dusted with grayish pollen, coxæ faintly tinged with reddish, claws and pulvilli in male elongate, in female short, anterior tarsi of the female broadened and flattened, middle tibiæ with several strong macrochætæ on the front side near the middle; calypteres orange; wing venation as in *Z. hæmorrhoidalis* F., the wings grayish tinged, the veins dark brown, bordered with dilute brownish, four or five bristles at base of R_{4+5} , and the median cross-vein almost straight.

Abdomen black, polished, very thinly grayish dusted; the pollen only apparent when the specimen is viewed from behind; in the male a small spot on each side of the abdominal segment red; second segment with strong median discal and marginal macrochætæ, and third segment with median discal discals and a marginal row of macrochætæ; fourth segment rather thickly covered with macrochætæ; sides of abdomen with both discal and marginal macrochætæ, more prominent in

the female; hypopygium of male prominent, the unchitinized portions reddish tinged. Length, 9 mm.

Described from one male and one female received from Dr. C. Gordon Hewitt, Division of Entomology, C. E. F., Ottawa, Canada. Specimens bred by Mr. Arthur Gibson from larvæ of *Hyphoraia parthenos* Harris, received from Mr. H. Dawson, Hymers, Ontario, Canada. Type, the female, No. 13,387 of the United States National Museum collection. Male co-type in collection of Division of Entomology, Department of Agriculture, Dominion of Canada. This species, which is very distinct, resembles *Lydina areos* Walk. in colour characters, but it is not so highly polished.

Schizotachina Walk. and *Acronarista* Town.

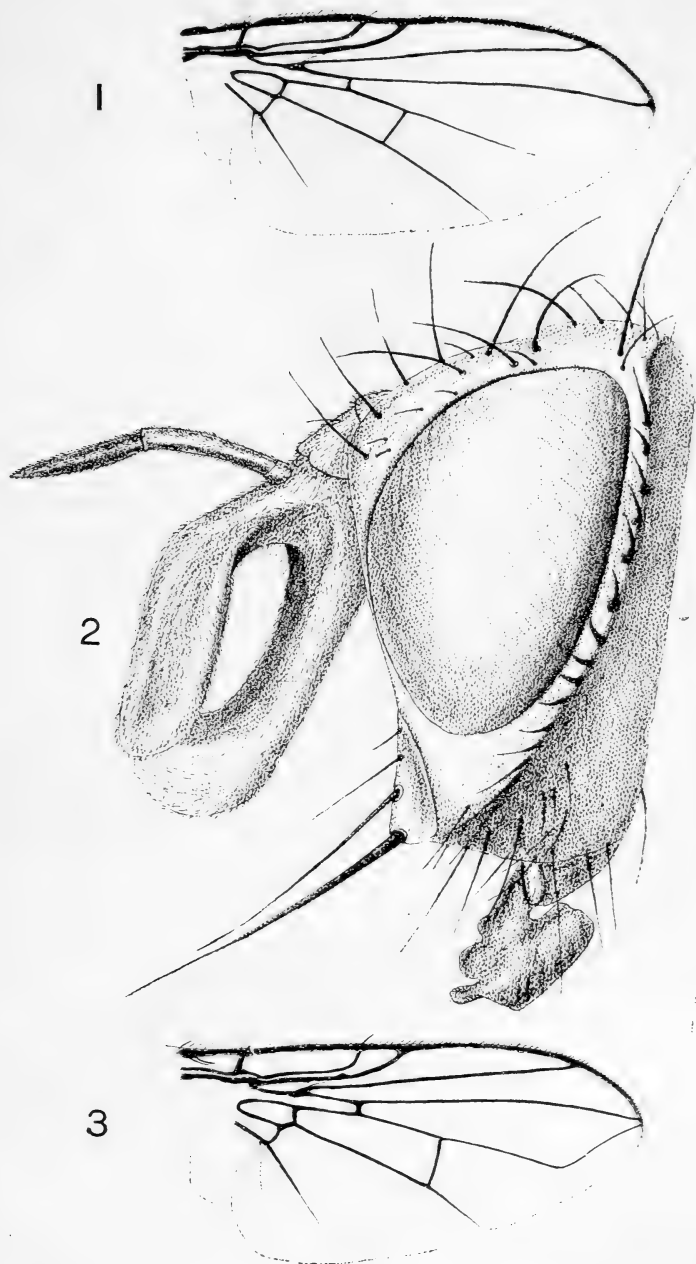
From a lot of the needles of *Pinus rigida* Mill. infested by larvæ of the Tineid *Paralechia pinifoliella* Chamb., collected by Mr. W. F. Fiske near Lowell, Mass., there issued, with some interesting hymenopterous parasites, a number of specimens of a small Tachinid. By the table to genera in Mr. Coquillett's "Revision," these specimens were determined as *Schizotachina*, but on comparison with a male specimen of *S. convecta* Walk., in the collection of the Boston Society of Natural History, they were found to differ from the latter species in having the vein M_{1+2} missing beyond the bend. The specimen of *convecta* had M_{1+2} distinct to the tip. Mr. Coquillett kindly examined the specimens in the United States National Museum collection, and found nine specimens which had been placed in the *convecta* series, having M_{1+2} obsolete beyond the bend. Since then I have examined these and find that they agree with my specimens. In all I have examined twenty-eight specimens of the form described below and six of the form which I identify as *convecta*. The species may be separated as follows:

Vein M_{1+2} distinct to the margin of the wing *S. convecta* Walker.
 Vein M_{1+2} missing beyond the bend *S. vitinervis*, n. sp.

Schizotachina vitinervis, n. sp. (Fig. 1, wing; 2, head.)

Black, less frequently partly or largely reddish, head and thorax bluish-gray pollinose, abdomen polished, only the narrow bases of the segments white pollinose; legs somewhat polished, thinly dusted with grayish pollen; palpi yellow; third antennal segment in male divided longitudinally, in the female more or less broadened and flattened; vein M_{1+2} entirely wanting beyond the bend.

Head at least twice as broad as long, front in the male broad, at narrowest part at least one and one-half times as wide as the eye; frontal



Schizotachina vitinervis, n. sp.—Fig. 1, wing; fig. 2, head.
Schizotachina convecta, Walk.—Fig. 3, wing.

vitta brownish, dusted with grayish pollen; two strong proclinate ocellar bristles; frontal bristles descending to insertion of arista; outside the frontal row two proclinate orbital bristles and a number of short black bristly hairs in both sexes; facial plate widening very strongly below, the parafacials at lower corner of eye almost linear; facial ridges ciliate on the lowest fourth; oral margin, cheeks and the occiput on and near the margin with black bristles; width of the cheeks less than one-half the height of the eye; head at vibrissal angles shorter than at base of antennæ; front, face, cheeks and occiput covered with bluish-gray or lead-coloured pollen; antennæ reaching to oral margin, which is not produced, second segment short, third about five or six times the length of the second segment, in the male cleft almost to the base as in *S. convecta* Walk.; the outer ramus, which bears the arista at its base, is laterally compressed and at a point about one-third of its length from the base, convex on the outer and concave on the inner edge, the lower two-thirds of the outer ramus perceptibly directed downward and inward toward the tip of the inner ramus; inner ramus rather broad, and antero-posteriorly compressed; when the antenna is retracted, the inner side of the inner ramus is closely appressed to the facial plate, and only its tip is visible from the side; inner ramus gently arcuate on its proximal three-fourths, the distal fourth bending forward, its tip reaching a little below the tip of the outer ramus, the two sometimes touching; antennæ dark brown, in some lights grayish silvery; female with the third antennal segment entire, not cleft, from one-third to about half as wide as long, more or less broadened and flattened, the lower hind corner rounded, the front corner angular, sometimes more or less projecting, the segment in some specimens more or less reddish tinged, especially along the inner border; arista basal, dark brown, with very short whitish pubescence, thickened almost to the tip, its first segment short, second segment subequal or two-thirds the length of the third; palpi varying from yellow to brownish, more or less flattened, in some specimens about half as wide as the proboscis.

Thorax in ground colour black, rarely reddish tinged. covered with bluish-gray, lead-coloured pollen, including the pleura; with two strong and two weak sternopleural bristles; with three postsuturals and one postacrostichal; the mesonotum also with numerous short suberect bristly hairs; scutellum concolorous with mesonotum; with two pairs of strong lateral and a pair of weak apical macrochætæ, and numerous strong, bristly hairs.

Legs black, rarely reddish, thinly grayish dusted; claws and pulvilli in both sexes short; hind tibiæ not ciliate, with a row of bristles of irregular length; middle tibiæ bearing a single macrochæta on the front side near the middle.

Wings hyaline, subcosta entering costa at an acute angle, third vein with a single long bristle at base, anterior end of median cross-vein at end of first third of the distance from the radio-medial cross-vein to the bend of M_{1+2} ; M_{1+2} entirely wanting beyond the bend; calypteres whitish.

Abdomen black, polished, only the narrow bases of the segments white pollinose, the fasciæ generally interrupted medially; first three segments with marginal and fourth with discal and marginal macrochætæ; abdomen with many rather strong bristly hairs, mostly appressed, when erect having in some specimens the appearance of discal bristles: hypopygium black, polished, thinly dusted with grayish pollen. Length, 2.5-3 mm.

Described from 15 males and 13 females, as follows: 1 female from Bisc. Bay, Fla., Mrs. Slosson coll.; 1 male bred by Mr. A. Busck from *Aristotelia roseosuffusella* Clemens, issued July 28, 1902; 2 males and 5 females, Nos. 16a and 16aa, labelled "par. on Tineid of *P. australis*, iss. Feb. 20, 21, 1880"; 12 males and 7 females, G. M. L., No. 2267T, bred from larvæ of *Paralechia pinifoliella* Chamb., infesting leaves of *Pinus rigida*. Material collected by Mr. W. F. Fiske near Lowell, Mass. Type, 1 male and 1 female from the last mentioned series, Gipsy Moth Lab., No. 2267T. Type No. 13398, U. S. N. M.

Schizotachina convecta Walker. (Fig. 3, wing.)

There seems to be no doubt that the specimens in the U. S. N. M. collection, which remain after the separation of *S. vitinervis*, represent the species described by Walker. In the wings of typical specimens the subcosta enters the costa perpendicularly, and the position and inclination of the median cross-vein are as shown in the accompanying figure; the facial ridges are strongly ciliate on almost the lower two-thirds, and the third arisal segment is twice as long as the second. However, among the half dozen specimens I have examined, I find some which have the facial ridges ciliate on only the lower third. The median cross-vein varies in position from one-third to one-half the distance from the radio-medial cross-vein to the bend of vein M_{1+2} . Vein M_{1+2} is always quite distinct to the margin of the wing, but the close relation of the species to *vitinervis* is evidenced by the fact that the part of the vein beyond the bend is weaker than the penultimate section. I have, therefore, refrained from

adding a new genus for the reception of *vitinervis* to the already too long array of Tachinid genera.

There are no definite host records for *convecta*. One specimen, G. M. L., No. 2152E, June 29, '10, bred at the Gipsy Moth Parasite Laboratory, issued from a box of material from which an adult of *Tortrix albicomana* Clem. afterward emerged, and it is possible that the Tachinid developed in another larva of the same Tortricid.

The determinations of the microlepidopterous hosts are by Mr. August Busck, to whom I am much indebted.

(To be continued.)

A NEW PSENID WASP FROM PERU.

BY T. D. A. COCKERELL, BOULDER, COLO.

Psenulus (Neofoxia) Townsendi, new species.

Piura, Peru, April 2nd, 1911. (C. H. T. Townsend).

♀.—Length a little over 6 mm.; black, with the second abdominal segment above and below, and the third (except a broad apical triangle of black above, nearly reaching basal middle) bright ferruginous; extreme apex of first segment also red at sides; inner orbital margins strongly convex; face covered with silvery hair; scape black; flagellum pale, dull reddish beneath, strongly infuscated above, not so robust as in *M. Eressoni* Packard; vertex shining; cheeks with silvery hair; mesothorax shining, minutely and sparsely punctured; scutellum very smooth and shining; postscutellum with brilliant silvery hair; area of metathorax triangular, with a few ridges, the same kind of sculpture continued on sides of metathorax; mesopleura with silvery hair; tegulae pale yellowish; wings hyaline, very iridescent; *second r. n. meeting second t. c.; submedian cell of hind wings squarely truncate at end*; knees, anterior tibiae, hind tibiae broadly at base and narrowly at apex, and the tarsi, pale ferruginous; petiole of first abdominal segment rather short.

♂.—Flagellum long and slender; abdomen long and cylindrical, black, with the second segment at apex, and the third and fourth slightly, ferruginous. Easily known from *P. medius* Smith by the sparsely punctured thorax.

Type.—Cat. No. 14096, U. S. Nat. Mus.

[This species belongs to the group of Nearctic species, composed of *tibialis* Cresson, *suffusa* Fox and *Sayi* Rohwer, which is characterized by the narrow pygidium, no tubercle between the bases of the antennae, slender petiole, which is nearly as long or longer than the rest of the first segment. (S. A. Rohwer.)]

August, 1911

THE PREPARATION OF A CATALOGUE OF THE INSECTS OF CANADA.

BY C. GORDON HEWITT, D. SC., DOMINION ENTOMOLOGIST, OTTAWA.

At a meeting of the Executive Committee of the Entomological Society of Ontario, held at Guelph, Ont., on November 4th, 1910, it was unanimously agreed that the preparation of a catalogue of Canadian insects was desirable, and that such a list should be dedicated to Dr. C. J. S. Bethune, in recognition of his long and valuable services to Canadian entomology as editor of THE CANADIAN ENTOMOLOGIST. A special committee of the society was appointed to arrange for and take charge of the work of preparing the proposed catalogue.

The following members constitute the committee: Dr. E. M. Walker (Pres.), Dr. C. Gordon Hewitt (Vice-Pres.), Messrs. G. Chagnon, N. Criddle, J. D. Evans, Arthur Gibson, W. H. Harrington, T. D. Jarvis, H. H. Lyman, G. A. Moore, G. E. Sanders, J. M. Swaine, A. F. Winn, F. H. Wolley-Dod, and Prof. T. D. A. Cockerell.

Suggestions as to the form and scope of the catalogue, and the method of preparation, were drawn up and submitted to the members in a circular, issued on March 10th, 1911, with a request that it should be considered, and that further suggestions should be submitted.

Opinions on the suggestions which were submitted, and further suggestions on the part of members of the committee have resulted in the formation of the following scheme, which will be adopted in the preparation of the catalogue, as they represent the views of the majority of the members.

1. The list will be entitled, "A Catalogue of the Insects of Canada and Newfoundland," and it will include all species known to occur in Canada (including Labrador) and Newfoundland, whether previously recorded or not. Alaskan species will not be included, but may be published as an appendix.

2. The various species will be classified under the orders, sub-orders, families, sub-families, and genera, in ascending order wherever possible. The arrangement of the genera will be systematic and, so far as is possible, the species also.

3. The names will be given of the authors of all generic and specific names mentioned, with the date (year) in the case of each genus.

4. Under each species will be given:

- (a). A reference to one or two good descriptions of the insect, not necessarily the original one; these will be descriptions which

are as accessible as possible. If possible reference will be given to a good published figure, and if such is contained in one of the references it will be indicated by the addition of (fig.) after the reference.

- (b). The geographical distribution within Canada and Newfoundland ; this will be indicated, as a rule, by Provinces, in order from East to West, e. g., N. S., Ont., B. C., etc. The characteristic faunal zones inhabited by the species will be indicated, so far as it may be possible, by abbreviations ; thus : Ar.—Arctic, H.—Hudsonian, C.—Canadian, T.—Transition.* Where a species is known from a few localities only, the names of these will be given with the name of the captor in cases where the species recorded is of great rarity.
 - (c). If the type locality of a species is Canadian it will be given, and the places where type specimens of Canadian species are deposited will also be given when possible.
 - (d). The Latin name of the chief food plants will be given in the case of the Lepidoptera, Cecidomyidæ, Aphidæ, Coccidæ, phytophagous Hymenoptera and Coleoptera. (Gray's New Manual of Botany, 1908, will be used throughout for the names of the food plants).
 - (e). In the case of parasitic species the name of the host or chief hosts will be given wherever known.
- 5. Recent important changes in synonymy will be noticed.
 - 6. In the case of new and previously unpublished records the collector's name will be given in every case.
 - 7. No species of which there is no trustworthy record or specimen available is to be included.
 - 8. Fossil species will be included, and also introduced species, including greenhouse species, but the fact that they have been introduced will be indicated in those cases in which the fact is known.

The work of preparing the catalogue will be divided among the members, approximately, as follows :

- Aptera, Orthoptera and Neuropteroid Orders.—Dr. E. M. Walker.
- Hymenoptera.—Messrs. W. H. Harrington, G. E. Sanders, and Prof. T. D. A. Cockerell.
- Coleoptera.—Messrs. J. M. Swaine, G. Chagnon, N. Criddle, and J. D. Evans.

It is intended to publish a map indicating these zones at an early date in this journal.

Lepidoptera.—Messrs. Arthur Gibson, H. H. Lyman, A. F. Winn, and F. H. Wolley-Dod.

Diptera and Aphaniptera.—Dr. C. Gordon Hewitt.

Hemiptera.—Prof. T. D. Jarvis, and Mr. G. A. Moore.

These members will be responsible for the lists prepared by them, and such lists will be published under their names. In the preparation of such lists it will be necessary to seek the co-operation and assistance of other specialists and all such assistance will be fully acknowledged.

The division of the work in the different orders will be systematic rather than according to the geographical regions in which the members may be located; this will necessitate the co-operation of workers in different regions.

In the compilation of the catalogue it is intended to index the species on the regular card, catalogue cards 5 in. x 3 in., which will be supplied to the members. A single species will be listed on each card. The card will thus contain the information which it is intended to include in the catalogue. For example, the Spruce Budworm, *Tortrix fumiferana* Clemens, would be indexed and listed as follows:

T. fumiferana Clemens.

Proc. Ent. Soc., Phila., v 139, 1865.

U. S. Ent. Comm., 5th Rep., pp. 830-838 (Packard), 1890.

Dist.: Eastern Can., Man., B. C.

Food Plants: Abies, Picea, Pseudotsuga.

The catalogue will be published, under the editorship of the writer, by the Geological Survey of Canada, by arrangement with and the consent of the Minister of Mines and the Director of the Survey. It will appear in parts as the different orders, or families, in the case of large families, are completed, and its publication will necessarily extend over a number of years.

NEW COCCIDÆ WITH NOTES ON OTHER SPECIES.

BY E. M. EHRHORN, HONOLULU, HAWAII.

Kermes shastensis, n. sp.

Female scale enveloped in a thick white, brittle, waxy secretion, making scale very striking and easily detected on the twigs of the trees. Scale round about 5 mm. in diameter. After removing waxy secretion, colour of scale is mahogany brown, very shiny, with usually three distinct dark brown lines across the dorsum. Derm, after boiling in K. O. H.,

August, 1911

remains light brown, with numerous round glands consisting of 6 or 7 small openings in a circle. Antennæ very small and indistinctly 6 jointed. Joint 5 apparently shortest, joint 3 longest, the whole antenna measuring $160\ \mu$. Joint 6 has several stout hairs. Legs short and stout, with a few hairs. Femur very much swollen, almost as broad as long. Tibia $40\ \mu$, tarsus $80\ \mu$, claw rather stout and slightly curved.

Larva lemon-yellow of the usual type. Antennæ well developed, quite stout, 6 jointed, joint 6 as long as $3 + 4 + 5$. Joint 1 and 2 subequal, joint 4 and 5 subequal. Formula 63 (12) (45), also 6 (123) (45). Legs short and stout. Caudal lobes well formed, with long setæ. Larvæ found in body of female.

Habitat.—On *Quercus chrysolepsis*, Shasta Springs, Siskyou Co., California.

Eriococcus eriogoni, n. sp.

Female enclosed in a closely felted, white sac, about $2\frac{1}{2}$ mm. long and $1\frac{1}{2}$ mm. broad. Female naked, shiny, chestnut brown. When seen through lens, quite bristly, segmentation very distinct. When boiled in K. O. H., body turns crimson and derm becomes transparent, all chitinous parts remaining light brown. Antennæ short and stout, 6 jointed, with joint 3 longest, longer than joints $4 + 5 + 6$. Joint 2 about twice as broad as long. Joints 4, 5 and 6 are much narrower than joints 1, 2 and 3. The following formulæ have been observed: 3, 1, (2, 6) (4, 5)—3 (1, 6) 2, (4, 5)—3, 1, 6, 2, (4, 5). The following measurements in μ have been observed: Joint 1, 36; 2, 32, 28; 3, 80, 92; 4, 20; 5, 20; 6, 32 and 36.

Dorsum thickly covered with conical spines, varying in length from $28\ \mu$ to $42\ \mu$. Caudal lobes well developed, with very long, stout setæ, about $280\ \mu$, and two very stout spines and several long bristles. Anal ring ordinary, with 8 long, stout hairs. Legs short and stout, with the following measurements in μ : Coxa 100; trochanter plus femur 188; tibia 104; tarsus 120. Trochanter with a stout bristle measuring $60\ \mu$. Claw stout and slightly curved, with denticle on inner curve. Digitules of tarsus long, fine-knobbed hairs, reaching to end of claw, those of claw, fine-knobbed hairs, reaching beyond claw. The legs are quite hairy.

Habitat.—On *Eriogonum stellatum* stems close to the ground. Flagstaff, Arizona.

Eriococcus salinus, n. sp.

Young larvæ rose coloured, very active. Antennæ stout, 6 jointed, each joint with several fine hairs. Joint 6, with numerous stout hairs at

apex, ending with stout spine. Formula: 6, 1, (2, 5) 3, 4. Measurements in μ are 1-40; 2-28; 3-24; 4-20; 5-28; 6-68. Legs long and stout. Coxa almost twice as broad as long, tibia shorter than tarsus, claw slender and slightly curved. Digitules fine hairs. Trochanter with long hair and tibia with two stout spines near distal end.

Caudal tubercles quite prominent, with long setæ. Anal ring with the usual hairs and a number of shorter spines. Adult female in sac about 5 mm. long and 2 mm. broad, tapering almost pyriform, snow-white of dense cotton. Dead female removed from sac reddish brown, segmentation distinct, about $4\frac{1}{2}$ mm. long, 2 mm. broad, convex above. Body almost void of powdery secretion and somewhat shiny. After gestation, body shrivels and sac becomes filled with loose cotton, in which the eggs are laid. When boiling in K. O. H. body turns cardinal, derm becomes colourless, with numerous small, round glands and fine spines. Antennæ 6 jointed, joint 1 much broader than long, joint 6 longest, then 1, then 2 and 3, which are subequal, joint 4 being the shortest. Formula: 6, 1, (2, 3) 5, 4. Measurements in μ are as follows: 1-64; 2-40; 3-40; 4-24; 5-35; 6-68. Some specimens have joint 6 subequal with joint 1 and joint 5 subequal with 2 and 3, so that the following formula is noticed: (1, 6) (2, 3, 5) 4. Each joint has several hairs, and joint 6 has a whorl of hairs at apex.

Legs short and stout, coxa broader than long, trochanter with spine about as long as tarsus. Tarsus quite hairy, claw long and sharply curved, digitules fine hairs. Anal ring about 80 μ in diameter, quite pronounced, with 6 long, stout hairs about 160 μ long. Caudal tubercles not conspicuous, with long setæ about 200 μ and with numerous spines and round glands.

Habitat.—On grass roots (*Distichlis* sp. ?) in salt marsh, Alameda shore, Alameda, California. July 25, 1906.

Sphærococcus cupressi, n. sp.

Adult female imbedded in a pit between the dry and growing bark, lying on and covered with cottony secretion, hiding the entire insect. Body about $1\frac{1}{2}$ mm. long and about 1 mm. broad, quite convex, resembling a *Diaspine* in outline. Colour pale pink, more or less transparent. When placed in boiling K. O. H., turns dark red, and after boiling derm becomes transparent.

Antennæ 6 jointed, short and stout. Joint 6 with numerous stout hairs. Some of the measurements in micro-millimeters of the joints are

as follows: 1, 24-20-20; 2, 24-23-24; 3, 32-24-20; 4, 20-16-12; 5, 24-16-16; 6, 44-36-32. The following formula have been observed: 6, 3, (1, 2, 5,) 4,-6, 3, (1, 2,) (4, 5)-6, 3, 5, (1, 2, 4,-)6, 2, (1, 3,) 5, 4.

Legs short and stout, tibia and tarsus subequal. Trochanter with a slender spine, tibia with two spines, which extend half the length of tarsus. Claw long and slender, digitules long, fine-knobbed hairs, reaching beyond claw. Anal opening very small, hairless. There are several small spines near opening. Margin beset with small spines at intervals of about 60 μ . Caudal end of body shows many circular spinnerets and numerous fine spines.

Young larva light yellow, very active. Antennæ 6 jointed. Joint 6 longest, then 3; joint 1 and 2 subequal; joint 4 and 5 subequal. Joint 6 with several stout hairs at end. Legs short and stout. Tarsus a trifle longer than tibia. Femur + trochanter almost twice as long as tarsus. Numerous stout hairs on each segment. Caudal setæ very stout and 160 μ long. There are several stout hairs between caudal setæ.

Habitat.—Under the dry bark and in crevices on the trunk of *Cupressus macrocarpa* at Niles, Alameda Co., San José, Santa Clara Co., Feb., 1903, and at Belvedere, Marin Co., California, 1908.

Ceroputo Koebeleii, n. sp.

Adult female thickly covered with white secretion. The specimens were received alive in rather bad condition, but after feeding and resting the insects reconstructed a large cottony sac, almost like a large *Pulvinaria*, in which eggs were laid. One individual measured, with sac, 10 mm. long and 4 mm. broad. Adult female is about 4 mm. long by about 2 $\frac{1}{2}$ broad at posterior end, narrowing cephalad a little. Body not very convex, dorsum quite rugose, segmentation distinct, posterior margin with deep cleft. After boiling in K. O. H., the derm becomes almost colourless except the area surrounding the marginal spines, legs, antennæ and mouthparts, which remain a dark brown. Antennæ 9 jointed, each joint with several long, fine hairs, joint 9 with several stout hairs near apex. Joint 3 longest, about twice as long as 2, joints 4 and 5 subequal, and joints 7 and 8 subequal. Measurements in micro-millimeters are as follows: 1-40, 2-40, 3-75, 4-55, 5-54, 6-48, 7-38, 8-35, 9-47. Formula approximately 3-4-5-6-9-(1-2) 7-8; or 3-(4-5) 6-9 (1-2) (7-8). Legs long and stout and quite hairy. Trochanter + femur very little longer than tibia. Tarsus less than $\frac{1}{3}$ of tibia, claw very strong, with well developed tooth, digitules not reaching to end. Spine on trochanter about as long as the outer curved margin of it.

Eggs light lemon-yellow.

Young larvæ lemon-yellow, covered with the usual cottony secretion and marginal tufts. Dorsum with three carina running longitudinally, marginal tufts composed of two and three joined filaments, resembling *Orthezia*. Legs dark brown, quite hairy. Tibia very little longer than tarsus, trochanter with long, slender hair. Margin with dark brown glands composed of short, stout spines, usually 3 in number. Antennæ 7 jointed, each joint with several long hairs. Formula: 7-3-5-(4-6) 2-1.

Habitat.—On *Quercus englemanni*, Benson, Arizona, A. Koebele, Mar. 25, 1907.

Trionymus californicus, n. sp.

Female elongate parallel-sided about $1\frac{1}{2}$ -2 mm. long by about $\frac{1}{2}$ mm. broad, slightly covered with white powdery secretion, not hiding segmentation. Colour of body lemon-yellow. Where insects are found between the sheaths, there is quite a lot of white powdery secretion, no ovisac present, female body containing young.

When placed in boiling K. O. H., body turns crimson and after boiling is colourless.

Antennæ 8 jointed, each joint with several short, fine hairs. There is quite a variation in the segments, even on the same specimen. The following formulæ have been found:

Joints in μ : 1-48, 2-48, 3-32, 4-24, 5-32, 6-28, 7-36, 8-64. Formula: 8(12) 7(35) 6.4, also 1-40, 2-28, 3-24, 4-24, 5-16, 6-28, 7-68. Formula: 7.1. (2.6) (3.4) 5. Also 1-48, 2-48, 3-36, 4-28, 5-28, 6-28, 7-32, 8-80. Formula: 8. (1, 2) 3. 7. (4, 5, 6). Joint 8 ending in long bristle about $\frac{1}{2}$ its length, antennæ about 200 μ apart.

Legs short and stout, quite hairy, middle leg about 400 μ long, tibia twice as long as tarsus. Anal ring quite large, with 6 hairs (80 μ), lobes very low, with long bristle (80-90 μ), and two stout spines, several hairs and numerous spinnerets. Margin sparsely set with short, curved spines. Digitules of tarsus long, fine-knobbed hairs, those of claw curved clubs.

Habitat.—On *Festuca* sp., near Lathrop, California.

XYLOCOCCLUS MACROCARPÆ Coleman.—(Journal N. Y. Ent. Soc., Vol. XVI, p. 198).

I found this species very abundant on *Libocedrus decurrens* at Sisson and Shasta Springs, and also on the same plant in the Yosemite Valley, Cal. This insect was doing considerable damage to young trees; this was

especially true where new forest was forming and where the young trees were close together and well shaded.

ORTHEZIA CALIFORNICA Ehrh.—(CAN. ENT., XXXVIII, p. 329).

A new locality for this species is on Mt. Tamalpais, Marin County, California, collected by Dr. E. C. Van Dyke.

ERIOCOCCUS HOWARDI Ehrh.—(CAN. ENT., XXXVIII, p. 331).

Received specimens collected by Mr. E. K. Carnes on *Quercus* sp., Cachecreek, Yolo County, California.

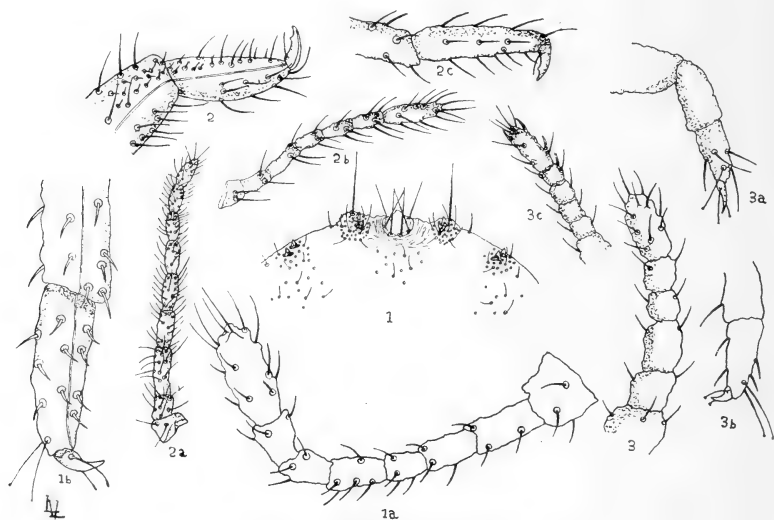


FIG. 17.—New Coccidae, Ehrhorn.

EXPLANATION OF FIG. 17.

1. Caudal lobes of *Trionymus californicus*.
- 1a. Antenna of adult female of *Trionymus californicus*.
- 1b. Tarsus and claw of adult female of *Trionymus californicus*.
2. Tarsus and claw of *Ceroputo Koebelei*.
- 2a. Antenna of adult female of *Ceroputo Koebelei*.
- 2b. Antenna of larva of *Ceroputo Koebelei*.
- 2c. Tarsus and claw of larva of *Ceroputo Koebelei*.
3. Antenna of adult female of *Sphaerococcus cupressi*.
- 3a. Tibia, tarsus and claw of adult female of *Sphaerococcus cupressi*.
- 3b. Tarsus and claw of larva of *Sphaerococcus cupressi*.
- 3c. Antenna of larva of *Sphaerococcus cupressi*.

FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MILLARVILLE, ALBERTA.

(Continued from page 236.)

170. *H. sora* Smith.—Vide notes under previous species. Banff, July 16th to 22nd, several specimens, from Mr. N. B. Sanson. The difference in dates of the Banff specimens is evidence in favour of distinctness of this form from No. 169. My remarks concerning *auranticolor* in my original note on this species (XXXVII, p. 21, 1905) should be disregarded.

171. *H. montana* Smith appears to be the correct name for this species, which is sometimes a day-flier at snowberry flowers on the prairies. *Montana* was described from Colorado as a probable variety of *inordinata*, and stands as a variety in Smith's Catalogue and Check List, and as "ab. 2" of that species in Hampson. Prof. Smith states that his type is in the Washington Museum. The specimen there bearing the Museum "type" red label is marked "? Type" on another label, and comes from Platte Canyon, Colo. A Denver, Colo., specimen in my own collection is exactly like some of my local series. *Inordinata* was described from Massachusetts, and most eastern specimens that I have seen are darker, and have maculation much more distinctly cut and contrasting, and have a somewhat strigate appearance. Some Colorado specimens that I saw in Prof. Smith's collection appeared about intermediate, so I do not wish to challenge the specific reference. But the only eastern specimen in my collection, from Stonnington, Conn., differs from my Colorado and local series much more than many eastern and western forms do from each other which are claimed to be good species. Hampson's figure seemed to me to be too even and brown for any specimen that I compared with it in the British Museum, but Massachusetts is given as the locality in the key to the plate. Except in having a distinct postmedial line on secondaries, it much more nearly resembles *montana* than most eastern specimens that I recollect having seen.

The type of *semilunata* Grote is a female in the British Museum from Washington Territory. It is grayer and more suffused than any of the specimens above mentioned, and lacks the reddish brown shades on primaries. My notes indicate that I thought it very probable that it might be a smoky dark female of *inordinata*. But a female from Washington stood under *semilunata* in the New York Museum, mixed with *montana*, which I noted was "dark, suffused, even and distinct" (*i. e.*, from

montana), though I did not compare it with Hampson's figure of *semilunata* type.

172. *H. allecto* Smith.—This was described from six specimens from Calgary, Alta.; Brandon, Man.; and Volga, S. D., which were stated to be like *mactata*, but black and gray instead of brown. In my original notes I stated that I had brown Alberta and Manitoba specimens, and in a bracketed note appearing a few pages further on, which I added in the proofs and intended as a footnote, I expressed doubt as to the validity of *allecto* as a species. I still maintain this view, and have several western prairie specimens, which grade through to the grayest forms, which could not possibly be distinguished from my Pennsylvania series without the aid of the labels. I have not taken the species here for some years, but some of my oldest specimens are my grayest. I have strong suspicions, however, that the gray specimens are apt to fade, especially as my notes tell me that the types which I examined at Washington in February, 1910, are distinctly brown. I should have called the male type from Brandon typical *mactata*, and the female type is scarcely grayer.

173. *H. egens* Walk. appears to be a prior name to *transfrons* Neum., as Sir George Hampson makes it. Walker's type is a badly rubbed specimen from "Hudson's Bay (Barnston)" according to the catalogue. This may mean close to the borders of Ontario, as many similar records do. *Bridghami* G. & R. is a close ally probably occurring in that region, of which I have no specimens in my collection. The type of *transfrons* is presumably in the Neumögen collection at Brooklyn, as stated in Smith's Catalogue, but I have no note of having seen it there. It is attributed to "B. C.," but that may mean Alberta. I never saw an authentic B. C. specimen.

174. *H. albertina* Hamps. (Cat. VII, 413, 1908)—Sir George Hampson has thus named this species from Calgary and Aweme, Man. specimens, making a Calgary male the type, and placing it, together with *claudens* and *hillii*, in the genus *Eremobia* Steph. He characterizes *albertina* as having ground colour bluish white and orbicular very oblique, as against ground colour gray and orbicular less oblique in *claudens*, of which he figures the type, a male from St. John's, Nfld. My own notes add that in type *claudens* the discoidal spots lack the pale annuli present inside the blackish defining lines in *albertina*. Type *leucoscelis*, which Hampson makes a synonym of *claudens*, is a female from Racine, Wis., and is like *claudens* but darker. I have a very pale series

from Vancouver Island which seem to answer Sir George Hampson's figure and description of *hillii* Grt., which he makes distinct on strength of a single male from Lewis Co., New York, from the Hill collection, not the type. The "*claudens*" recorded from Kaslo in the Record for 1906 was on my authority. But it was compared and agreed with my Calgary series, and must therefore be *albertina*. I am short of outside material in this group, and further notes will not be of much value at present. The *claudens* of the Washington Museum appeared to me to be the *hillii* of Hampson.

175. *Polia contacta* Walk.—The form occurring here is bluer gray than typical *pulverulenta*, which was described from Colorado, or than true *contacta* = *diffusilis*, the former type being from St. Martin's Falls, Hudson's Bay Territory, and the latter from Lewis Co., N. Y. Sir George Hampson had only a single Calgary male as *pulverulenta*, of which the figure is not good. In the tables he separates them by a darker termen in *contacta*, against concolorous in *pulverulenta*. Many of my local specimens have dark suffusion beyond the s. t. line, reaching sometimes nearly to the termen, indicating that this is probably a variable character. A series of Kaslo, Calgary and New York specimens stood in the Washington collection as "*contacta* = *sansar*." I am inclined to agree with Dr. Barnes in considering the Calgary species identical with *contacta*. Whether *pulverulenta* is really distinct I am not in a position to say. The only Colorado material I have examined are the types at Washington, and one or two in the Strecker collection. The distinctness was by no means clear to me, and the antennæ are alike. The type of *extincta* Smith, which seems another close ally, I overlooked. But Sir George Hampson is quite wrong in referring *sansar* Strecker to *contacta*. On whose authority he did this I know not, but the same error appears in the Washington collection, and *sansar* is wrongly recorded from Kaslo in the Kootenai List. The type is a female from Seattle, Washington, and may turn out to be *ædon*, which comes from Washington also. Hampson's figure of this was not available when I was at Chicago for comparison.

176. *P. medialis* Grt.—I believe all the specimens before referred to by me under this heading to be of this species. I have a pretty good series (twenty specimens in all) from Montreal, and from Miniota and Cartwright, Man., from which latter locality I compared one with the type in the British Museum, a female from Schenectady, N. Y. Some specimens are black and gray only, others are rather strongly tinged

throughout with olivaceous brown. The orbicular varies from small and nearly round, dark-centred, and completely defined, to large, oblique, ovate or irregular, uniformly pale, incomplete above, sometimes produced to a point posteriorly. The reniform sometimes runs back, and in one specimen fuses broadly with the orbicular. The t. p. line varies from moderately dentate to very strongly so. The median band is often not merely constricted but actually divided in the submedian interspace by the anastomosing of the pale-filled t. a. and t. p. lines. This variation appears to me to cover Sir George Hampson's diagnosis of *acutissima*, of which I have examined the male type from Montreal in the British Museum, figured by a woodcut in the Catalogue. I doubted their distinctness when I saw both in the British Museum, and the doubt has augmented considerably since seeing more material. I refrain from direct reference till I have recompared specimens with both types. *Acutissima* seems to be characterized by the very strongly dentate t. p. line, and the obliquely V-shaped orbicular, the V being slightly curved.

As yet I have seen nothing under the name of *confragosa* that I suspect of being distinct. I have not seen the description, and the type, according to Smith's Catalogue, is in Abbé Belanger's collection, wherever that may be.* Hampson's figure of a Wisconsin specimen in the Washington Museum does not help me, being well within the observed variation.

• 177. *Hyppa* sp.?—This is not *xylinoides*, meaning thereby the species commonly passing under that name in the east, which has male antennal branches about one-third longer. There are slight differences in the arrangement of colour and shades, but I had never suspected them to be of specific value until I noticed the antennal differences, which, so far as I have observed in a large number of specimens from many localities, are quite constant. Species in this genus are not, as a rule, very variable, and the colour differences in this case are far less than what I often claim to denote mere local variation in other genera. But though inclined to be evanescent, they appear to be correlative with the antennal differences, suggesting that they are peculiar to the species. I have a fine male of *xylinoides* from as far west as Miniota, Man., whilst of the distinct Calgary form I have a good series from Winnipeg and vicinity from Mr. Wallis, who, so far, has not sent me *xylinoides* male. The Calgary form also occurs at Kaslo and Ainsworth, B. C., and, I think, on Vancouver Island, though I have only poor females from thence, and I am not sure. B. C.

*Laval University, Quebec (per A. F. W. in litt.).

specimens are larger, but the slight colour differences hold. As a whole, my species has more gray, and less red than *xylinoides*, in this respect approaching *indistincta*, of which I am not sure that I have yet seen a male. Sir George Hampson did not notice the antennal differences, as he catalogues Calgary specimens with *xylinoides*, which, as I understand it, his figure of a New York specimen well represents. Guenée's species, however, is claimed to have two synonyms, *contraria* Walker and *ancocisconensis*, Morr. Re-examination of the types of Guenée and Walker, both from Trenton Falls, N. Y. (Doubleday), and both in the British Museum, will be necessary before pronouncing them the same as Hampson's figure. Of Morrison's species, I have not seen the description, nor do I know the location or origin of the type, nor the meaning of the name he chose. I should prefer to see his type, or at least to hear more about it, before publishing my manuscript name for No. 177. *Rectilinea* Esp., of Europe, has antennal branches shorter than the form under discussion.

178. *H. brunneicrista* Smith.—In mentioning *xylinoides* in my comparison with this, it must be understood that I referred to my No. 177. The differences apply about equally well, however, to *xylinoides*, except that the length of the pectinations in *brunneicrista* male do not exceed those of *xylinoides* by as much as they do those of No. 177. Whilst they are about double the length that they are in the latter, they are only about one-quarter longer than in *xylinoides*. In other respects *brunneicrista* is less closely related to *xylinoides* than is No. 177. A good series was taken at treacle in 1909, between June 21st and 30th, and several at light last year, so that I have been able to distribute quite a number amongst other collections. On both occasions its congener was more rare. I saw a female from California in Prof. Smith's collection.

181. *Homohadena badistriga* Grt.—Of the three specimens previously referred to under this heading, a pair, dated Aug. 3rd, 1897, and Aug. 8th, 1901, are the species described and figured by a woodcut as *badistriga* by Sir George Hampson. I have seen neither Grote's description nor type, so have no means of verifying the name. The species has a whitish ground, sparsely irrorated with gray, and conspicuously streaked and suffused with cupreous brown and streaked with black, with cross lines generally distinct in my specimens. The secondaries are whitish, usually outwardly in the male, darker in the female. I have a male and three females from Milwaukee Co., Wisconsin, which are like my Calgary pair, but the male has whiter secondaries and the females are paler

throughout. The collar is contrastingly pale, whitish, black lined. It is not the species figured by Holland as *badistriga*, to which my third specimen referred to in my original notes probably belongs, and to which I shall refer under the additions. The species of this group appear to be much missed in eastern collections, and as they do not seem common, I am somewhat at sea as to the variation.

185. *Oncocnemis poliachroa* Hamps. (Cat. VI, 175, 1906).—Sir George Hampson has thus described the species I had listed as *chandleri*, and all previous records of *chandleri* from the Northwest and from B. C. that I have been able to verify refer to his species, of which the type is from Calgary, and which is the *chandleri* of Holland's Moth Book. As it happens, I have a specimen of true *chandleri* from High River, which I have compared with the type, and which will be referred to later.

NEW TIPULIDÆ (DIPTERA).

BY CHARLES P. ALEXANDER, ITHACA, N. Y.

The following crane-flies are believed to be new to science :

Adelphomyia minuta, sp. nov.

Antennæ, first segment light reddish-yellow, remainder light brown, with a thick, white pubescence; rostrum reddish-brown, palpi brown; front and vertex reddish-yellow, thinly grayish-pruinose; a row of pale yellow hairs along the inner margin of the eye; occiput reddish-yellow. Pronotum yellow; mesonotum, præscutum brownish-yellow, with a thin white bloom, a row of long yellow hairs on either side of the median line; scutum and scutellum pale yellow; metanotum almost white. Abdomen yellow, with a white pruinosity on the caudal margin and with long scattered yellow hairs; ovipositor brownish yellow. Halteres yellow, knob barely darker. Legs pale yellow, darker on the tibiæ and tarsi. Wings hyaline, stigma indistinct, yellowish; veins pale yellow, C, R and Cu somewhat brownish.

Subcosta quite long, extending almost to the anterior margin of cell R_3 ; Sc_2 far distant from the tip of Sc_1 , so that Sc_1 is four times the length of Sc_2 . Radius long, cross-vein r far back from tip, about four times its length and near to the anterior end of cell R_2 . R_s moderately long, arcuated at origin, about equal to R_3 ; R_{2+3} from one to one and one-half the length of the basal deflection of Cu_1 ; basal deflection of R_{4+5} about

one-half of cross-vein *r-m*; *r-m* usually about as long as the basal deflection of Cu_1 . Petiole of cell M (M_{2+3}) usually long, two-thirds the radial sector. Cu_2 usually about twice the basal deflection of Cu_1 . Basal deflection of Cu_1 under the middle of the discal cell. In most specimens the cross-vein *m* is much reduced, or even lacking, due to the great length of the second deflection of M_3 .

Length, ♂, 3.3–4.4 mm.; average, 3.6 mm.; wing, 4.1–4.2 mm.

Length, ♀, 4.5–4.9 mm.; average, 4.7 mm.; wing, 4.6–4.7 mm.

Type.—♂, Coy Glen, Ithaca, N. Y., May 21, '11.

Co-types.—12 ♂s, 3 ♀s; same time and place as the type.

This tiny species is quite similar in venation to the species which I have determined, provisionally, at least, as *Adelphomyia senilis* Hal. In that species cross-vein *m* is always present in the scores of specimens examined.

The two species are of nearly the same size, with *minuta* averaging smaller. Although the distal cells of the wings of *senilis* are notably pubescent, and of *minuta* entirely glabrous, except in a few abnormal specimens, I have no hesitation in referring both species to the same genus, because of the similarity of venation and genitalia of the ♂. The valves of the ovipositor of the ♀ are much more curved in *minuta* than in *senilis*.

The species was very common on rank vegetation near rapids in Coy Glen.

Phylodorea subcostata, n. sp.

♂.—Eyes black, with a purple reflection. Antennæ, first segment, elongate-cylindrical, somewhat broader distally; second globular; third to last similar to one another in shape, cylindrical-ovate, with four or five long black hairs arranged in a partial verticil about the center; the last few joints are more slender and shorter than those preceding; antennæ black, with a thick gray pubescence throughout; the extreme base of segment three is brown in some specimens. Rostrum and palpi black. Entire head black, with a gray pruinosity. Pronotum light gray pruinose; mesonotum black, with a thin yellow bloom on the sides, middle of præscutum shiny black; postscutum gray-pruinose. Metanotum gray. Sides of thorax, including base of coxæ, thickly gray-pruinose. Fore leg, tip of

coxa, trochanters and basal third of femur light yellow ; remainder of femur, tibia and tarsus dark brownish-black ; middle leg similar to fore, but apical half of femur dark coloured ; hind leg similar to fore, but only the apical third of the femur is dark, tibia paler brown ; tarsus as in fore leg. Halteres rather long, yellow throughout. Abdomen above black, the dorsum of each segment being paler in the basal two-thirds ; genitalia black ; beneath dirty blackish-yellow.

Wings hyaline, stigma rather indistinct, brown ; veins at base of wing strongly yellow, giving this colour to the wing at this region ; subcosta is yellow for its entire length, the other veins for a short distance only ; radius and costa of a paler brown than the other veins.

♀.—Similar to ♂, but genital segment light brown.

Subcosta long, fork very close to tip, Sc_2 being about twice as long as Sc_1 , ending anterior to cell R_3 . Radius long, cross-vein r at tip ; radial sector often angulate, with a spur at the angulation, rather short, longer than R_2 , but not as long as R_3 . Vein R_{2+3} about equal to the basal deflection of Cu_1 . Basal deflection of R_{4+5} shorter than R_{2+3} ; cross-vein $r-m$ two-thirds the length of the basal deflection of Cu_1 . Petiole of cell M (vein M_{1+2}), variable in length, from as long as the $r-m$ cross-vein, to one and one-half the length of the basal deflection of Cu , or from two-fifths the length of cell M_1 to nearly twice as long as this cell. Very considerable variation occurs in the two wings of the same specimen. Basal deflection of Cu_1 , under the middle of cell 1st, M_2 . Cu_2 equal to, or very little longer than, the basal deflection of Cu_1 . $Cu_1 + M_3$ about equal to basal deflection of Cu_1 . Cells R_3 , R_5 and 1st M_2 usually in one line.

Length, ♂, 5.9–6.3 mm. ; ♀, 6.5–7.3 mm. ; wings, ♂, ♀, 6.5 mm.

Type.—♂, Coy Glen, Ithaca, N. Y., May 21, '11.

Co-types.—♀ ♀, Coy Glen, May 21, '11 ; ♀, Six-Mile Creek, Ithaca, N. Y., May 21, '11. (Thompson and Rutherford.)

This species belongs to the *fratria* group, and appears to be closest to *costatu* Coq. from New Mexico ; from *fratria* and *costata* it differs in being much smaller and decidedly distinct in coloration.

PECULIAR HABITS OF A HEPIALID MOTH.

WITH SOME REMARKS ON THE SYNONYMY OF SAME.

BY J. MCDUNNOUGH, M.D., DECATUR, ILL.

During the summer of 1910, while on a collecting trip for Dr. Wm. Barnes, of Decatur, Ill., I spent the second week of August at Cloud Cap Inn, on the northern slope of Mt. Hood, Oregon. While collecting during the early afternoon, about 2.30 p.m., on some steep, sandy slopes covered with asters and short grass, at an altitude of 6,500 feet, I noticed what I took to be some species of small Noctuid, darting with extreme rapidity in a zig-zag erratic flight close to the ground up and down the slope. The insect would fly to the top of the slope, which was bordered with dwarf pines, then turn and dart downwards, always remaining in the hottest sunshine. Following it was out of the question, owing to the nature of the ground and the rapidity of the flight; in fact, it was only with difficulty that I could keep the moth in sight at all. Finally it flew straight towards me, and by a lucky stroke of the net I secured it. My surprise was great on finding that I had captured a small *Hepialid*; I had always been under the impression that the flight of this entire group took place at dusk, for a few minutes only, and was of a heavy hovering nature rather than a swift, powerful flight; to find, therefore, a species flying in the bright sunshine with the rapidity of a bee-moth proved rather astonishing.

I kept my eyes open for further specimens, and was soon rewarded by seeing several skimming up and down the slopes in an identical manner. It was, however, one thing to see them and quite another to catch them, and after an hour's hard work I had only succeeded in securing four specimens. After 3.30 the flight seemed to die down, and I saw no more. As all the specimens taken appeared to be males, it occurred to me to search in the low herbage for females, and I was rewarded by obtaining a pair in coitu, sitting on a low stalk just above the ground.

The following day I was on the spot bright and early, but before 1.30 p.m. saw not a single specimen. The main flight occurred as on the previous day, between 2.30 and 3.30 p.m.; the insect was fairly common, but most difficult to approach. I secured two pairs in the grass and seven or eight on the wing, mostly freshly-emerged specimens.

On the third day the flight was not so good, the weather being cooler. I had, however, the good fortune to discover, about 2.30 p.m., a virgin ♀

ascending a grass-stalk ; arrived near the top it folded the hind wings closely around the body and commenced vibrating the fore wings rapidly—almost immediately the summons was answered, a male appeared on the scene, and before I could prevent it coition had taken place. No further males were taken that day. During the remainder of my stay the weather was cold, cloudy and windy, and I saw no further specimens. There seems no reasonable doubt but that the species flies only in the hottest sunshine of early afternoon, and that flight ceases once copulation has been effected. It is possible that the cool nights prevalent at this high altitude have caused the alteration in habits, although I have taken *H. humuli* at a similar altitude in the Swiss Alps at dusk, as usual.

At the time the identity of the species was unknown to me. I could only note that the species showed apparently great sexual dimorphism, the males being deep reddish-brown, with numerous silver spots and bands on primaries, whilst the females were lighter brown, in one case immaculate, in the others with an irregular black broken line, following the course of the silver bands in the male.

On returning home, with the excellent collection and library of Dr. Barnes at my disposal, it was easy to identify my species as the one commonly known as *hyperboreus* Mösch., according to Dyar's Catalogue. Considerable doubt exists in my mind as to whether the synonymy as given by Dyar is entirely correct, and with a view of perhaps eliciting further information on the subject, I propose to make a few remarks on the different names :

H. hyperboreus Möschler.

The species was described from a single male from Labrador ; according to the figure and description, the band extending irregularly from base to apex is broken, and does *not touch the inner margin of wing* ; there are several silver spots on the outer margin, besides those at base and along costa ; the ♀ is undescribed. Holland (Moth Book) figures a specimen from the U. S. Nat. Mus., with no locality given. It agrees fairly well with Möschler's figure, but the band appears to touch the inner margin. I have seen no specimens from Labrador or the extreme East, and should advise collectors in these localities to keep a sharp look out for it.

H. pulcher Grote.

Described from a single male from Colorado. Female undescribed. Grote's figure and description agree well with those of Möschler, although there is a wide difference in locality. I am inclined to agree with Dr. Dyar in making it a synonym of *hyperboreus*. I have seen no Colorado material, but would place my species from Mt. Hood under this name, as the males appear to agree. As in *hyperboreus*, the band does *not* touch the inner margin, and is more or less broken; the arrangement of spots on outer margin, costa and base is also very similar. In the ten males captured on Mt. Hood, considerable variation exists; the band is mostly broken and very irregular; in three cases, however, it is entire, but *in no case does it approach* the inner margin; the silver spots of the outer margin are always present, also the large spot at end of cell; the costal and basal spots vary somewhat in each specimen; as stated above, four of the females captured show no traces of silver, one being immaculate, light brown, and the others with traces of a thin black line following the general course of the silver band of the male sex. On spreading the specimens I came across a single female with silver markings, which I had evidently taken on the wing and confused with the males. The band is entire and rather broad and regular, well removed from inner margin; the other silver markings are much reduced, but there are traces of spots along outer margin. Long series from Colorado will be necessary to establish the identity of our form.

H. MacGlashani H. Edw.

Described from a series of specimens of both sexes from Truckee, Calif. As described by Edwards, the band is continuous and *connected with the inner margin* by a spur of silver. The spots on outer margin *are lacking*. Both sexes are similar.

The species bears great resemblance to *ganna* Hbn., from Europe. We do not know this species, but a figure is given in Spuler, Die Schmetterlinge Europas. Dr. Barnes possesses a single ♀ from the type locality; further, four pairs from Hymers, Ont., collected by Mr. Horace Dawson, and three specimens from Calgary, Alta. These all show a marked similarity; the band is continuous, the spur to inner margin broad, and the silver spots of outer margin lacking; the sexes are practically similar, and Mr. Dawson tells us that of about 100 pairs captured the females were in every instance silvered. Further, the species is a

typical dusk-flier. Mr. McGlashan informs us that he always takes his specimens at dusk; the Hymers specimens were also captured at this time of day. Taking all the above points into consideration, we are inclined to think that, if not synonymous with *ganna*, *MacGlashani* is a perfectly valid species.

H. Matthewi H. Edw.

Species described from Brit. Columbia, listed by Dyar as variety of *hyperboreus*. Dr. Barnes possesses only a single rubbed male from Victoria, B. C., which is too poor to make much of. From the description it might be closer to *MacGlashani* than *hyperboreus*. The male alone was described. It behooves our Western friends to furnish good series of this in both sexes.

H. confusus H. Edw.

The type was a single specimen from Alaska. The silver banding appears from the description to be replaced by pale fawn, but we have seen neither the type nor any specimens agreeing with the description. We do not know Dr. Dyar's reasons for placing it as a variety of *hyperboreus*.

H. roseicaput N. & D.

Described from a single male (?) from Cascade Mts., B. C. The description reads rather like that of our female *pulcher* from Mt. Hood, except that this latter species has no blackish subterminal line. Possibly this may be the ♀ of *Matthewi*, described in error as a male; the localities are certainly closely approached.

A NEW SPECIES OF THE SCELIONID GENUS *ACOLOIDES* HOWARD.

BY A. ARSENE GIRAULT, CHAMPAIGN, ILL.

Superfamily Proctotrypoidea.

Family Scelionidae.

Subfamily Baeinae.

Genus *Acoloides* Howard.

1. *Acoloides aureus*, species nova.

Normal position.

Female.—Length, 1 mm. Moderate in size for the genus.

Usual to the genus with the exception of the parapsidal furrows, which are slightly indicated. Winged, the wings short, with moderately

August, 1911

long fringes ; mandibles tridentate ; basal nervure absent. Postmarginal vein as long as the marginal or slightly longer.

Agreeing with *melleus* Ashmead, in general colour, but differing in that the first funicle joint is slightly wider than long, not twice longer than wide, distinctly not half the length of the pedicel ; also all the other funicle joints are distinctly wider than long. Also agreeing with *ochraceus* Ashmead, but the abdomen is not striated longitudinally (excepting basally at the second and third segments), the antennæ not marked with brown-black, the wings not subhyaline, but deeply fumated and with rather long fringes.

General colour honey-yellow, the vertex and sides of abdomen inclined to be darker ; eyes dark, naked ; all appendages concolourous excepting wings, which are deeply fumated throughout, the fumation deepened somewhat under the stigmal vein and including its knob. Vertex and mesonotum rather coarsely, reticulately punctured, the punctures not deep. Ocelli pallid. Venation dusky.

Fore wings much shorter than the abdomen, petiolate, the blade ovate and fringed with moderately long, silky marginal fringes, the longest of which are about two-thirds the wings greatest width ; apex obtusely pointed.

Stigmal vein long and slender, ending in a small knob ; the marginal vein very short, punctiform, the postmarginal vein moderately short, about a fourth the length of the stigmal ; discal ciliation of the fore wings dense, short, uniform ; a half dozen or more long bristles from the venation. Strigil present on cephalic legs. Abdomen depressed rounded ovate, the first and second segments longitudinally striated at base, the ovipositor exerted slightly, very slender.

Antennæ 7-jointed, capitate, the club large, solid, compact ovate, the scape long and cylindrical, longer than either the club of itself or the funicle plus the pedicel ; the latter about equal to the first three funicle joints combined (no ring joint), or slightly shorter ; funicle plus pedicel subequal in length to the club ; first funicle joint subquadrate, slightly wider than long, the other three funicle joints transverse, subequal, a third shorter than the first. Pubescence of antenna short and sparse.

Male.—Unknown.

Described from a single female specimen found mounted on a slide in a collection of some Signiphorinæ loaned to me for study by Dr. L. O.

Howard, and bearing the labels, "248. 1247. 1247 ♀. Aphel. 248 do. C. H. T. Mch. 15, 10. T. Johuaimaji. Feb. 11."

Habitat.—Peru, South America.

Type.—Type No. 14,026, United States National Museum, Washington, D. C., 1 female in xylol-balsam (mounted with a single female of *Signiphora*).

BOOK NOTICES.

THE HOUSE FLY.

"THE HOUSE FLY," by L. O. Howard. XIX + 312 pp., 1 pl., 40 figs. Frederick A. Stokes Company, New York, 1911.

One of the most extraordinary examples of the fickleness of human nature is furnished by our attitude towards the commonest of all insects. Even the youngest of us was brought up in companionship with this homely creature, and taught to regard with painful horror the iniquity of destroying, however painlessly, this permanent guest. Well might we say when introducing this volume to the public, *Tempora mutantur, nos et mutamur in illis*. From the high pedestal of kindly regard *Musca domestica* has sunk to depths so loathsome and portentous as to make even an entomologist recoil from these "winged sponges spreading hither and thither to carry out the foul behests of contagion," to quote the words of Lord Avebury, written so long ago as 1871.

The credit of first seriously attracting public attention to the possible dissemination of disease germs by the house-fly belongs to investigators in the United States. The experience of the Spanish-American war, with its excessively heavy mortality from typhoid fever, was repeated in the South African war a few years later. Circumstantial evidence has been confirmed by exact experiments, which, though in many instances they may modify primary conjectures, have shown that the house-fly, if the necessary conditions prevail, will serve as a most serious carrier of pathogenic organisms. On this account, therefore, it ranks as one of the proven disease-carrying insects, and must be included with the mosquito, the tse-tse fly and the flea in that class of insects which bear a serious relation to national welfare. No one has done more to inculcate these ideas into the minds of people, obsessed with the customary apathy, than Dr. Howard, who was one of the first to consider the house-fly and to study it in its new relation, deserving well the title of "Commander-in-Chief of the Fly-fighting Army," recently conferred upon him by a well-known journal. From Dr. Howard

we should expect the best possible account of this insect and its disease-carrying proclivities, and to say that he has not disappointed us is only half of the confession. The remaining half is known by those who know the author, and will soon be discovered by the readers of this book who have not that good fortune. "This book," the introduction states, "is not intended to be a scientific monograph; it is simply an attempt to tell in an understandable way what is known about the subjects indicated in the title." Such a book, giving in a readable and complete fashion an account of the house-fly, its habits and development, its relation to disease and methods of control, was greatly needed, and we are glad that such an account is now available for the general reader. The first hundred pages are devoted to the fly, its life-history and habits and its natural enemies. The succeeding chapter gives a most complete and succinct account of the carriage of disease by flies, which, by its extent, will surprise many readers who have not devoted much attention to the subject. In an excellent and most practical chapter the various means of preventing and eradicating this potential disease-carrier are described and fully discussed; this chapter is probably the most valuable contribution to this question which has yet been made, and we sincerely hope that it will find its way into the hands of sanitary authorities and others, upon whom the solution of this problem largely depends. An account of other species of flies inhabiting houses is given and is fully illustrated. The illustrations are excellent and well chosen. We have, however, one serious criticism to make: by force of habit we turned to refer to the index; there is no index.

C. GORDON HEWITT.

THE TSE-TSE FLIES.

"A HANDBOOK OF THE TSE TSE FLIES (GENUS *Glossina*)," by Ernest E. Austen. X + 110 pp., 10 coloured plates and 24 figs. in text. British Museum (Natural History) London, 1911.

In no branch of medical entomology and pathology has so rapid progress been made during the past few years as in the causes of those dread diseases, the human disease known as Sleeping Sickness, and the disease of domestic animals, known by the native name "Nagana." These diseases are caused by microscopic protozoal organisms called *Trypanosomes*, which are carried by several species of Tse-tse flies. The Tse-tse flies are related to our own *Stomoxys*, but are confined to the Ethiopian region. Among the Diptera they are most remarkable for their method of reproduction; instead of depositing eggs the female produces a single full-grown

larva at each birth, and this immediately crawls away and pupates, having been nourished by special glands associated with the female reproductive organs. The deadly nature of these diseases is now well known, and, as the author asserts in the opening paragraph, these insects are of vital importance to the prosperity and future development of tropical Africa.

Eight years ago the author published his "Monograph of the Tse-tse Flies." At that time the relation of *Glossina palpalis* to Sleeping Sickness had not been determined, and little was known with regard to the habits of that species. Seven species of Tse-tse flies were described and illustrated. That volume is now out of print, and the present volume is an attempt to bring the subject up to date. Fifteen species are described, including two described for the first time. The author has made excellent use of the valuable material, probably unique in its extent, which he has at his disposal in the collections of the British Museum, and the present account of the group will be of very great value to workers, especially to those engaged in the field. The brevity of the accounts of the bionomics of the species, with the exception of *G. morsitans*, indicates how much there is to be learnt, in what is, from the point of view of prophylactic measures, the most important section of the subject.

We note with regret that the author does not regard *G. submorsitans* Newst. as specifically distinct from *G. morsitans* Westw., but considers it as a form of *G. morsitans*. While agreeing with the author, that the wide distribution of *G. morsitans* might account for the variability in colouration, we do not think that he can ignore, as he appears to do, the differences in the male genitalia. Newstead's species was created after the examination of 93 examples, and the illustrations in his account of the male genitalia of Tse-tse flies clearly indicate that the male genitalia of *G. submorsitans* Newst. are morphologically distinct from those of *G. morsitans* Westw. in the character of the superior claspers. Newstead's excellent paper is further evidence of the fact that in so highly organized a group as the Muscidae, and, one might say, in the Diptera generally, we shall have to take into consideration such important specific characters as are indicated by the male genitalia. This fact is also shown in the study of the Tachinidae. Specific distinctions cannot always be based on external form, but are often dependent on other morphological characters, which the systematist must necessarily take into consideration, and of these the genitalia are important, not only in Diptera, but also in Lepidoptera and Coleoptera.

C. GORDON HEWITT.

Mailed August, 2nd, 1911.

The Canadian Entomologist.

VOL. XLIII.

LONDON, SEPTEMBER, 1911.

No. 9

ON *CÆLOPISTHIA NEMATICIDA* PACK., A CHALCID PARASITE OF THE LARGE LARCH SAWFLY, *LYGÆONEMATUS ERICHSONII* HARTIG.*

BY C. GORDON HEWITT, D.SC., DOMINION ENTOMOLOGIST, OTTAWA.

In the course of a study of the European and North American parasites of the Large Larch Sawfly, *Lygæonematus erichsonii* Hartig, which was begun several years ago, observations have been made on the life-history of this Chalcid parasite. Its abundance in the cocoons of *L. erichsonii* kept under observation would indicate that it is an important factor in the natural control of the sawfly in the Eastern States and Canada, and for this reason and also because hitherto it has been undescribed, the present account is written.

Packard† first referred to this parasite in the account of his investigations on *Lygæonematus erichsonii* which were made immediately after the latter insect had been discovered as a forest pest in the United States and Canada. He says :

"A number of cocoons sent us in 1882 by Mr. Atkins were found to be in every case tenanted by a minute chalcid parasite, belonging to the genus *Pteromalus*. If new it may be called *Pteromalus nematicida* (Plate XII, Fig. 8). About a hundred of these issued from the cocoons in the breeding-box during May, 1883. This parasite must, therefore, be a most destructive enemy of the larch worm."

Beyond the figure of the parasite, which is given and again reproduced with the above account in the Fifth Report of the United States Entomological Commission (1890), no further description is given. From the correspondence printed in this account of the injuries of the sawfly it would appear that Mr. Charles F. Atkins collected the aforementioned cocoons in Maine.

No further description of this insect, so far as I am aware, has been published since Packard provisionally named it.

*Contributions from the Division of Entomology, Ottawa.

†In "The Report of the Entomologist," "Ann. Rept. of the Commissioner of Agriculture, 1883," Washington, D.C., pp. 138-142.

Cocoons of *L. erichsonii* were collected in the larch section of the forest belt at the Central Experimental Farm, Ottawa, in May, 1910, and on May 21st, a few days after bringing them into the laboratory, 25 specimens of the Chalcid emerged; 22 specimens did not emerge, but were dissected out. A careful examination of the parasite indicated its similarity on the whole, but not entirely, to Packard's figure already mentioned. This was kindly confirmed by Mr. C. T. Brues, of the Bussey Institution of the Harvard University, who placed it in Förster's genus *Cælopisthia*. The occurrence of this parasite was discussed with Mr. W. F. Fiske, in charge of the Gipsy Moth Parasite Laboratory, Melrose Highlands, Mass., who also examined cocoons of *L. erichsonii* collected at Wellesley, Mass., and found the pupæ of this parasite in these cocoons on July 28th. Mr. Fiske arranged for cocoons to be collected for me from the same locality, and these were received on September the 13th. At this time practically all the larvæ of *L. erichsonii* have gone underneath the turf and have formed cocoons and are thus prepared for hibernation. It was upon this material that most of the following observations were made.

During my absence from Ottawa for several weeks, Mr. G. E. Sanders kept the records, and he has also drawn up the description of the adult at my request, which assistance I wish to gratefully acknowledge.

DESCRIPTION OF THE ADULT.

Cælopisthia nematicida Pack.

Female (Fig. 19).—Length, 1.7 to 2.1 mm. Average length of ten specimens, 1.92 mm. Colour black; the head and thorax closely and evenly reticulate, slightly hispid, giving strongly metallic dark green reflections; the abdomen black, smooth and glossy; antennæ non-metallic, the scape and pedicel brown, the flagellum darker brown; coxæ for the most part black with a green metallic lustre, tips slightly brown; legs non-metallic pale-brown, femora fuscous; wings hyaline, venation pale-brown; eyes dark, variable somewhat, but usually giving a purplish reflection.

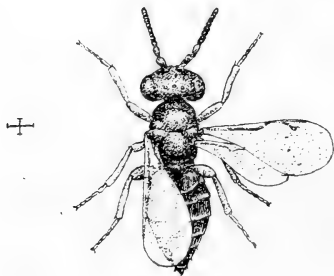


FIG. 19.—*Cælopisthia nematicida* Pack., female, x 12.

Head (anterior aspect), broadly oval; antennæ inserted on an imaginary line drawn from base to base of the eyes; face broadly depressed along scapes; clypeus twice as wide as long, immarginate, notched in

centre ; (lateral aspect), genal sulcus absent, cheek slightly shorter than the eyes, full ; eyes oval, very slightly narrowed ventrally ; (dorsal aspect), head twice as wide as long, wider than the thorax, slightly narrowed behind the eyes ; occiput immarginate, strongly concave ; ocelli arranged on an obtuse angled triangle, the distance of the lateral ocelli from the eye being about equal to that of the lateral ocelli from each other.

Thorax : Pronotum visible from above, not so wide as the mesonotum, slightly produced into a neck forward, length about half that of the mesonotum. Mesothorax slightly more coarsely reticulated than the remainder of the thorax ; parapsidal furrow distinct for half the length of the mesonotum, anterior margin rounded ; axillæ produced forward to a line drawn from tegula to tegula not meeting by half their width ; scutellum rounded, full, slightly more than half the length of the thorax ; post-scutellum narrow, strongly margined. Metathorax shorter than the scutellum, angular posteriorly ; spiracles broadly oval ; sulci absent ; lateral carinæ well marked ; median carina present ; articulation with abdomen high margined ; a distinct circular depression on either side and near to the articulation.

Abdomen : Broadly ovate, as long as thorax, greatest width at segments 3-4, subsessile ; ovipositor slightly exerted ; first visible segment the longest, about one and a half times as long as the second, the five following subequal.

Wings : Hyaline, submarginal vein slightly longer than one-third of the wing ; marginal vein the same thickness as the submarginal, as long as one-quarter of the wing ; postmarginal and stigmal veins short, subequal, the stigmal vein ending in a short knob, the knob having a short process directed towards the tip of the postmarginal vein.

Antennæ : Pubescent throughout, 13-jointed including the two ring-joints, the scape reaching almost to the median ocellus, moderately slender ; the pedicel one and a half times as long as any of the flagellar joints, obconic ; flagellar joints longer than thick, subequal, slightly and regularly clavate.

Mandibles : Brownish yellow, similar, each quadridentate.

Male.—Average length, 1.6 mm. Colour similar to female, reflections brighter green mixed with purple. Penis exerted. Antennæ shorter, more compact, joints of flagellum shorter than broad and more pubescent.

LIFE-HISTORY.

The development of the last and overwintering brood was studied. Females were observed ovipositing on September 13th. The time occupied in the process varied. A single female, which was isolated for observation, remained in the same position for $1\frac{1}{2}$ hours (see Fig. 20) with her ovipositor inserted in the cocoon. She then removed her ovipositor and walked away, moving about for twenty minutes, after which she returned and inserted her ovipositor in almost the same spot as before and remained in this position ovipositing for fifty-five minutes.



FIG. 20.—Female *C. nematocida* ovipositing on cocoon of *Lyzowonematus erichsonii* Hartig, $\times 2\frac{1}{2}$.

In several instances two females were seen ovipositing in the same cocoon. The numerical abundance of the eggs that may be deposited in a single cocoon may be judged from the fact that in one case eighty-one eggs were counted on a single larva; in another case forty-seven pupæ and adults were contained in a single cocoon. The sawfly larvæ in cocoons in which the chalcids had deposited eggs appeared less active than those in uninfected cocoons; this may be due possibly to some paralysing action on the part of the female when ovipositing.

The eggs are .3 mm. in length and transparently white. In shape they are ovally elongate, having one end broader than the other, and are slightly curved (Fig. 21). They are deposited externally upon the larva,



FIG. 21.—Interior of anterior end of cocoon of *L. erichsonii*, showing eggs of *C. nematocida* deposited on the sawfly larva, $\times 15$. Also single egg of *C. nematocida*, $\times 30$.

chiefly in the anterior and thoracic region and appear to be laid in masses

with no attempt at placing them, were this possible. In three days all the larvæ had hatched from eggs deposited by females on September 13th.

The larva, when newly emerged, is transparent and vitreous in appearance.

In the breeding experiments considerable difficulties were encountered owing to the prevalence of the entomophagous fungus, *Isaria farinosa* (Dicks) Fr., which repeatedly attacked the sawfly larvæ under observation. This caused the chalcid larvæ to cease feeding and leave the host usually one or two days before the fungus was observed. On this account no observations of a continuous nature could be made upon the same chalcid larvæ. Nevertheless, the observations were made upon larvæ which emerged from eggs all deposited on the same dates, namely, September 13th and 14th, on cocoons which were separated and kept under observation. They belonged, therefore, to the same series of larvæ, and the observations will be given as if they appertained to the same larvæ, which, under the circumstances, is permissible.

Sept. 18.—Two days after emerging from the eggs the larvæ were all
1910. feeding, being attached to the host larva by their heads in leech-like manner. For a day or two they did not appear to leave the place of original attachment.

Sept. 21.—Several larvæ had moved their positions, one being attached to the eye of the host larva.

Sept. 27.—Two larvæ from one of the cocoons left the cocoon and travelled one or two centimetres from the cocoon. They were replaced in the cocoon, but had evidently ceased feeding, although another larva in the same cocoon had its head still buried in the side of the host.

Subsequent observations and examination indicated that these larvæ were full grown. The larvæ may become mature, therefore, in about twelve days.

Oct. 9.—The larvæ were still in the cocoons, full grown and not feeding. They hibernate apparently as full-grown larvæ in the cocoons of the host.

Mar. 3.—Four of the hibernating larvæ had pupated, but several larvæ
1911. still remained unchanged.

Apr. 21.—Two adult chalcids emerged.

This would make the time of development of the over-wintering brood about seven months, under experimental conditions. Passing the

winter in this manner the parasite occupies that portion of the year, during which the climatic conditions would prohibit its activities in the way of attacking fresh cocoons, were it able to produce more broods.

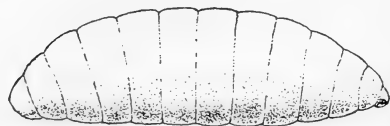


FIG. 22.—Full-grown larva of *C. nematocida*. $\times 12$.

The Larva.

The full-grown larva (fig. 22), measures 2.35 mm. in length. It is white, and the body, which consists of thirteen segments, has the

dorsal side more strongly convex. The larva feeds externally, usually with its head buried in the side of the host.

Number of Broods.

As it is not found possible in these experiments to follow the development of a single line of the parasites through the year, exact statements as to the number of broods during the season cannot be made at present. I believe, however, that it is safe to make inferences from the observations which were made on material collected in Massachusetts and in Canada. In one batch of cocoons, adults emerged on October 9th from cocoons in which eggs had been deposited on September 13th to 16th, from which it would appear that the time of development of a summer brood was about 23 days. It has been found that the females oviposit shortly after emergence, so that no lengthy period necessarily intervenes between the development of the broods if the parasite can find healthy cocoons of the sawfly.

The prevalence of healthy cocoons of the host would determine the efficiency of the parasite. It has been found in studying the life-history of the host *L. erichsonii* that the sawfly larvæ may become full grown and form the cocoons as early as June 12th to June 17th, which would mean that in any year cocoons of that year's sawfly larvæ could be found from the middle of June. Further, it has also been found that sawflies will continue to emerge from the cocoons of the larvæ of the previous year until the end of June, which indicates that there is a supply of the previous year's larvæ in their cocoons until the first or second week in June. In short, it has been found that cocoons containing larvæ of *L. erichsonii* may be found throughout the whole year, the time of least abundance being in June. It may be assumed, therefore, that if the Chalcid can find healthy cocoons, and this has been shown to be possible during the whole of the year, the production of broods may continue throughout that portion of the year during which the climatic conditions

permit the activity of the Chalcids. From my observations on the emergence of the Chalcids, this is from the latter part of May to the beginning of October, namely, about five months. On the basis of these facts, there is sufficient time for the development of about six broods during the open season; assuming that healthy cocoons are available on the emergence of the adult Chalcids. The cocoons are usually so located under the turf, as to be readily accessible to these small Chalcids, which, on emerging from one cocoon, would soon seek a healthy host. It would seem, therefore, from the study of the parasite and from such evidence as I have been able to collect concerning the history of the prevalence of its host in certain localities, that this species is one of the chief factors in the natural control of *L. erichsonii* wherever the Chalcid occurs.

Summary.

In the observations which were made on the development of the Chalcid *Cælopathia nematicida*, it was found that in the September and October broods the eggs, which are laid on the host larvæ inside the cocoons, hatch in two to three days; the larvæ become full grown in ten to twelve days, and the adults may emerge about twenty-three days after the eggs were deposited. The parasite feeds externally and hibernates as a mature larva inside the cocoon of the host. A number of broods of the parasite occur annually.

ON THE HABITS AND STRIDULATION OF *IDIONOTUS* *BREVIPES* CAUDELL, AND OTHER NOTES ON ORTHOPTERA.

BY E. M. WALKER, TORONTO, ONT.

Since recording the capture of the northern Dectician, *Idionotus brevipes* Caudell, at Fort William, Ont. (CAN. ENT., XL, p. 209), I visited the same locality again in 1910, and succeeded in finding the insect a second time, on the second and eighth of August.

I found that it is by no means confined to open grassy places, as I had supposed, but occurs also in paths and old lumber roads in the depths of the spruce swamps, which still cover the greater part of the flat country surrounding Fort William and Port Arthur. The tree growth in these swamps consists mainly of black spruce, interspersed with tamarack, white cedar and balsam fir.

With the exception of a single female, which I found squatting close to the ground on a path in the swamp, all the specimens taken were males,

September, 1911

and were all traced by their stridulation. When discovered, they were sometimes found perching in a conspicuous position upon the upper side of a leaf or twig of some shrub, a few feet from the ground, but several times the sound was traced to the trunk of a tree, and the musician was in some cases too high up to be detected. One was seen on the trunk of a black spruce, about twelve feet from the ground, and could just be reached with the net by standing upon a nearby stump.

The stridulation of this grasshopper is a soft trill of little volume, audible at a distance of but a few yards. It is sometimes continuous for some seconds, but is generally interrupted rhythmically, the divisions being produced at a rate varying according to the amount of sunshine. In bright sunshine I counted forty in fifteen seconds, the rate being thus $2\frac{2}{3}$ divisions per second, but on an afternoon when the sun was almost wholly overcast the rate was reduced to forty-one or forty-two in thirty seconds, or about half the rate in sunshine. When close to the stridulating insect I could detect that there were no absolute pauses between the trills, a very low trilling sound filling in all the intervals. The rhythm is not always quite regular. Sometimes after a succession of trills of apparently equal length one may be shortened or lengthened, and then the regular trilling resumed.

All the specimens of this insect seen were of the brachypterous form, with one exception, in which the tegmina and wings were similar to those of the macropterous individual figured on plate 7, CAN. ENT., *loc. cit.*

The stridulation of *Chloealtis abdominalis* Thomas was also heard repeatedly at this locality, and can be fairly well represented by "zip-zip-zip" repeated continuously at a rate varying from five per second (late afternoon sun, nearly overcast), to a little over six per second (bright sunshine). Doubtless the rates in both these cases vary more than these observations show, it being a general rule among the Orthoptera that a lowering of temperature produces a corresponding retardation in the rate of stridulation.

Only one species of Orthoptera was taken in the vicinity of Fort William that was not observed here in 1908. This was *Nemobius fasciatus abortivus* Caudell. The specimens were confined to a small sandy area thinly clothed with grass and weeds. They were very small, and the stridulation was a low continuous trill, differing thus from that of typical *fasciatus*. It is thus possible that this form is specifically distinct.

NEW SPECIES OF EMPRIA.

I.—EASTERN SPECIES.

BY ALEX. D. MACGILLIVRAY, ITHACA, N. Y.

Empria cavata, n. sp.—Female. Clypeus uniformly flat or convex; antennal furrows broadly rounded depressions, continuous from the antennal foveæ to the lateral ocelli; the ocellar basin a broadly depressed area from near the antennæ to the median ocellus; the median fovea a minute pit; the ocellar and interocellar furrows wanting; the clypeus broadly, roundly emarginate; the third segment of the antennæ longer than the fourth; the saw-guides straight above and broadly rounded to a blunt point at apex above; the body black, with the labrum, tegulæ and the legs, except a spot on the outer margin of the coxæ, white. Length, 7 mm.

Habitat.—Oswego, N. Y. Mr. C. S. Sheldon, collector.

Empria callosa, n. sp.—Female. Clypeus uniformly flat or convex; antennal furrows linear, broadly interrupted on the middle of the front; the ocellar basin a distinct depression extending to the median ocellus; a linear depression with a distinct median fovea at its ventral end; the ocellar furrow indicated at middle, the interocellar furrow distinct; the clypeus moderately, deeply, angularly emarginate, with a low projection at middle; the third segment of the antennæ slightly longer than the fourth; the saw-guides straight above, convex below, narrowly, obliquely rounded at apex; the body black, with the clypeus, labrum, tegulæ, a line on the collar, the coxæ at apex, the trochanters more or less, the front femora, the middle and hind femora at apex, the front tibiæ and tarsi, the middle tibiæ at base and beneath and their tarsi, and the hind tibiæ at base, dirty white. Length, 7 mm.

Habitat.—Ithaca, N. Y.

Empria catrata, n. sp.—Female. Clypeus uniformly flat or convex; antennal furrows linear, broadly interrupted on the middle of the front; ocellar basin a distinct depression extending to the median ocellus, with broadly sloping sides, with a deep, broad, median fovea at its ventral end; the ocellar and interocellar furrows distinct; the clypeus slightly biemarginate at apex, practically truncate; the third and fourth segments of the antennæ subequal; the saw-guides convex above, convex below, broadly, convexly rounded to a blunt point at the middle of the apex; body black,

with the collar, tegulæ, base of the wings, and the legs, white. Length, 6 mm.

Habitat.—Ames, Iowa. Professor E. D. Ball, collector.

Empria celsa, n. sp.—Female. Clypeus uniformly flat or convex; the antennal furrows linear, broadly interrupted on the middle of the front; the ocellar basin wanting or at most indicated only adjacent to the median ocellus, the median fovea deep, with flaring sides; the postocellar area and the dorsal margin of the head polished; the region of the ocellar furrow flattened; the ocellar and interocellar furrows distinct; the clypeus angularly emarginate, the lobes broadly rounded; the third segment of the antennæ longer than the fourth; the saw-guides with the upper and lower margins parallel and truncately rounded at apex; the body black, with the clypeus at sides, the labrum, the tegulæ, collar, wings at base, and the legs beyond the apices of the coxæ, except the front and middle femora more or less beneath, the hind femora in great part, and the hind tibiæ at apex, white. Length, 6 mm.

Habitat.—Ithaca, N. Y.

Empria callida, n. sp.—Female. Clypeus with a median carina; ocellar basin dumb-bell-shaped, constricted to a mere line at middle, broad, pit-like adjacent to the median ocellus; the median fovea an elongate pit; the antennal furrows interrupted on the middle of the front; ocellar and interocellar furrows distinct; the clypeus emarginate, with a distinct tooth at middle; the third segment of the antennæ longer than the fourth; the saw-guides with the upper margin straight, the lower margin converging, and broadly, obliquely rounded at apex; the body black, with the labrum, clypeus, collar, tegulæ, base of the wings, and the legs beyond the apices of the coxæ, white. Length, 6 mm.

Habitat.—Ithaca, N. Y.

Empria cava, n. sp.—Female. Clypeus with a median carina; clypeus with a broad, convexly rounded median ridge, occupying almost one-third of the width of the clypeus; the antennal furrows interrupted on the middle of the front; the median tooth of the clypeus distinctly shorter than the lateral lobes, the lateral lobes broadly rounded; the ocellar furrow linear, the interocellar furrow broad and distinct; the third segment of the antennæ almost as long as the fourth and fifth together; the saw-guides convex above and below, slightly, obliquely rounded at

apex; the body black, with the collar, tegulæ, front and middle legs below the knees, and the hind tibiæ beneath, white. Length, 6 mm.

Habitat.—Lancaster, N. Y. Mr. M. C. VanDuzee, collector.

Empria calda, n. sp.—Female. Clypeus with a median carina; clypeus shallowly, angularly emarginate, almost truncate, with a small but distinct tooth, the lateral lobes angularly rounded; the ocellar basin extending to the median ocellus; the median fovea a rounded pit opposite the dorsal margin of the antennal foveæ, the front not strongly produced between the antennæ; the ocellar and interocellar furrows deep and distinct; the third segment of the antennæ slightly longer than the fourth; the saw-guides slightly concave above, convex below, broadly rounded to a blunt point at middle of apex; the body black, with the labrum, collar, tegulæ, the front and middle legs below the apex of the femora, and the basal third of the hind tibiæ, white. Length, 6 mm.

Habitat.—Durham, N. H. Mr. J. C. Bridevell, collector.

Empria cata, n. sp.—Male. Clypeus with a median carina, distinctly but shallowly, roundly emarginate, with a minute tooth, the lateral lobes acute; the ocellar basin extending to the median ocellus; the median fovea a pit opposite the middle of the antennal foveæ; the front strongly produced between the antennæ; the ocellar and interocellar furrows distinct; the third and fourth segments of the antennæ subequal; body black, with the collar and tegulæ white; the front and middle legs beyond the basal third of their femora and the hind legs beyond the apical fourth of their femora yellowish infuscated. Length, 6 mm.

Habitat.—Mt. Washington, N. H. Mr. W. F. Fisk, collector.

Empria caprina, n. sp. Male and female. The ocellar basin extending beyond the median fovea to the middle of the antennal foveæ and dorsally to the median ocellus; the supraclypeal area elevated; the median fovea but little deeper than the ocellar basin; the front strongly produced between the antennæ; the ocellar furrow only faintly indicated, the interocellar furrow distinct; the clypeus deeply, roundly emarginate, with a minute tooth at middle, the lateral lobes angular; the third segment of the antennæ longer than the fourth; the saw-guides convex above, straight below, and broadly rounded at apex; with the clypeus, labrum, tegulæ, collar, and legs beyond the coxæ, white. Length, 7 mm.

Habitat—Ithaca, N. Y.

Empria casta, n. sp.—Female. Clypeus with a median carina, broadly, shallowly, roundly emarginate, with a low, broadly rounded tooth at middle, the lateral lobes rounded; the ocellar basin extending to the median ocellus, narrow and linear, ending ventrally in a pit-like median fovea, but little if any wider than the ocellar basin; the ocellar and interocellar furrows distinct; the third segment of the antennæ longer than the fourth; the saw-guides gradually converging on upper and lower margins, and broadly, roundly pointed at apex; the body black, with the margin of the clypeus, labrum, line on the collar, tegulæ, front and middle legs below the coxæ (except infuscation on the middle of the femora), hind trochanters, tip of hind femora, base of hind tibiæ, and base of their tarsi, white. Length, 7.5 mm.

Habitat.—Salineville, Ohio; male, Phoenix, N. Y.

Empria celebrata, n. sp.—Female. Clypeus with a median carina, broadly, shallowly, roundly emarginate, with a low broad tooth at middle, with broadly rounded lobes; ocellar basin rather broad, broader near the median fovea, the median fovea a broad crater; the ocellar furrow indicated, the interocellar furrow broad and distinct; the third segment of the antennæ distinctly longer than the fourth; the saw-guides convex above, straight and converging to the roundly truncated apex; the body black, with the clypeus, labrum, collar, tegulæ, trochanters, the front legs below the middle of the femora, the middle and hind legs beyond the knees, the apex of the hind tibiæ and the hind tarsi more or less infuscated, white. Length, 7 mm.

Habitat.—Buffalo, N. Y. Mr. E. P. VanDuzee, collector.

Empria captiosa, n. sp.—Female. Clypeus with a median carina, with a small, acutely pointed tooth at middle; the ocellar basin broad, with sloping sides; the ocellar and interocellar furrows distinct; the third segment of the antennæ longer than the fourth; the saw-guides convex above and below, broadly, convexly rounded at apex, the extreme apex truncate for a short distance; the body black, with the clypeus, labrum, collar, tegulæ, and legs below the knees, white. Length, 6 mm.

Habitat.—Ames, Iowa. Professor E. D. Ball, collector.

Empria cæca, n. sp.—Female. Clypeus with a median carina, angularly emarginate, with broadly rounded lobes, and with a broadly rounded median tooth; the supraclypeal area narrow and carinately elevated; the median fovea an elongate pit, with flaring sides at the

ventral end of the ocellar basin ; the ocellar furrow indicated, the inter-ocellar furrow distinct ; the third segment of the antennæ distinctly longer than the fourth ; the saw-guides parallel above and below, and rounded at apex ; the body black, with the clypeus, labrum, tegulæ and collar narrowly white ; the legs more or less infuscated. Length, 6 mm.

Habitat.—Ithaca, N. Y.

Empria cariosa, n. sp.—Female. Clypeus with a median carina, deeply, narrowly, angularly emarginate to near the middle of the clypeus ; the supraclypeal area rather broad and convexly elevated ; the clypeal lobes roundly pointed and the median tooth small but distinct ; the ocellar and interocellar furrows distinct ; a depressed area in front of the median ocellus ; the third segment of the antennæ distinctly longer than the fourth ; the saw-guides with the upper and lower margins parallel and broadly, truncately rounded at apex ; body black, with the clypeus, labrum, collar, tegulæ, front and middle legs beyond the apices of the coxæ, the base of their femora more or less infuscated, the hind trochanters, tibiæ and tarsi, sometimes infuscated, white. Length, 7 mm.

Habitat.—Slatterville—Caroline, N. Y.

Empria cauduca, n. sp. Clypeus with a median carina, truncate at apex ; the antennal furrows adjacent to the antennal foveæ well marked ; the ocellar furrow linear, distinct ; the interocellar furrow broad and deep ; the third segment of the antennæ distinctly longer than the fourth ; the saw-guides convex above and below, broadly converging to a blunt point just above the middle of the apex ; the body black, with the front and middle legs below the middle of the femora and the base of the hind tibiæ ringed with white. Length, 7 mm.

Habitat.—Ithaca, N. Y.

Empria castigata, n. sp.—Female. Clypeus with a median carina, the median tooth almost as long as the lateral lobes, all angular, the clypeus appearing tridentate ; the interocellar furrow only extending to the median ocellus, forming only the stem of a Y ; the median fovea only a rounded scar ; ocellar and interocellar furrows linear, deep ; the third and fourth segment of the antennæ subequal ; the saw-guides convex above and below, and slightly, obliquely rounded at apex, the lower angle more rounded than the upper ; the body black, with the collar, tegulæ, front and middle femora beneath at apex, front tibiæ, middle tibiæ beneath, and a ring at the base of the hind tibiæ, white. Length, 6 mm.

Habitat.—Battle Creek, Mich. Professor J. M. Aldrich, collector.

Empria casca, n. sp.—Male. Clypeus with a median carina, a small median tooth, and the lateral lobes rounded; the interocellar furrow extending each side of the median ocellus, forming an inverted Y-shaped furrow; the median fovea a wedge-shaped depression; the ocellar furrow faint; the postocellar area with a median furrow; the antennæ with the third and fourth segments subequal; body black, with the collar, tegulæ, apical half of the front and middle femora, their tibiæ, and the knees of the hind legs, all more or less infuscated, white. Length, 6 mm.

Habitat.—New Haven, Conn. Dr. W. E. Britton, collector.

Empria evecta, n. sp.—Female. Clypeus with a median carina, the median tooth short, the lateral lobes broadly angular; the interocellar furrow extending each side of the median ocellus, forming an inverted Y-shaped furrow; the median fovea a broad pit with flaring sides; the ocellar furrow linear; the saw-guides convex above and broadly, convexly rounded below and at apex to a blunt point; the body black, with a line on the collar, the apex of the front and middle femora, their tibiæ, and the basal third of the hind tibiæ, white. Length, 6 mm.

Habitat.—Sandy Hook, N. J.

Empria candidula, n. sp.—Female. Clypeus with a median carina, narrowly, deeply emarginate, with a small median tooth and carina, the lobes broadly angular; the median fovea of moderate size, with perpendicular sides, except in front, strongly flaring; a triangular shaped pit in front of the median ocellus; the ocellar furrow fine, the interocellar furrow broad; the saw-guides straight above, straight below and converging to apex, apex with angles broadly rounded and square at middle; body black, with the clypeus, labrum, collar, tegulæ and legs below the knees, tibiæ and tarsi more or less infuscated, white. Length, 6 mm.

Habitat.—Ithaca, N. Y.; Algonquin, Ill. W. A. Nason, collector. No. 5829.

Empria canora, n. sp.—Female. Clypeus with a median carina, broadly emarginate; the postocellar area longitudinally carinate at middle, the ocellar furrow faint, the interocellar furrow distinct; the third segment of the antennæ longer than the fourth; the saw-guides convex above and below, convexly and slightly obliquely, truncately rounded at apex; the body black, with the clypeus, labrum, collar, tegulæ, the front

and middle legs below the coxæ, the femora more or less infuscated, the hind trochanters, and a ring on the base of the hind tibiæ, white. Length, 6 mm.

Habitat.—Sherborn, Mass., Mr. A. P. Morse, collector; Connecticut, Mr. W. A. Nason, collector. No. 5829.

Empria cauta, n. sp.—Female. Clypeus with a median carina, angularly emarginate, with angular lobes; postocellar area not carinate; the ocellar basin wanting, the median fovea a pin-hole pit; the ocellar and interocellar furrows faint; the third segment of the antennæ longer than the fourth; the saw-guides convex above and oblique below, roundly truncated at apex; the body black, with the clypeus, labrum, collar, tegulæ, front and middle trochanters, and the hind tibiæ and tarsi, white. Length, 6 mm.

Habitat, Ithaca, N. Y.

(To be continued)

DANIEL WILLIAM COQUILLET.

A gap in the ranks of active entomologists and a feeling of personal loss to all who knew him has been created by the death of Mr. D. W. Coquillett, of the United States Bureau of Entomology and National Museum, who died at Atlantic City on July 8th.

In systematic entomology he had a knowledge of Diptera as wide as it was unique; in economic entomology he has the credit of being the first to discover and demonstrate the value of hydrocyanic acid gas as an insecticide.

Born in 1856, near Woodstock, Ill., we find him in 1880 contributing an article on "Larvæ of Lepidoptera" to Prof. Cyrus Thomas's Tenth Illinois Report, and a "Report on the injurious insects of Northern Illinois" to the Illinois State Entomologist's Report of the following year. In 1881 he became assistant to the State Entomologist of Illinois. Later, on account of his health he removed to Los Angeles, California, and while there he joined the staff of the United States Bureau of Entomology, in 1885, as field agent in the work on the Scale *Icerya purchasi* Mask. The results of this work during the succeeding two or three years were of such a nature as to secure for him a singular distinction as an economic entomologist. He communicated to Prof. W. G. Johnson the circumstances attending his chief discovery. "During the summer of 1886," he wrote, "I was employed by the United States Department of Agriculture to carry on a series of experiments at Los

Angeles, California, against the Cottony Cushion Scale (*Icerya purchasi*), but owing to an insufficient appropriation I was laid off on August 1st of that year. As no perfect remedy at that time had been discovered, I determined to experiment with gases in a private capacity, at my own expense. Accordingly, during the first week of the following month I began experimenting with hydrocyanic acid gas, which I thought would be the best for the purpose, owing to its very poisonous qualities, the rapidity of the generation and the readiness with which it diffuses itself in the air. Nobody suggested to me to try this gas. It was not until the following July that the Department of Agriculture again placed me on its rolls." Dr. Howard has called my attention to the fact that Mr. Coquillett had entire charge in California of the first importations of the parasites of *Icerya purchasi* which were sent over from their native haunts in Australia by Mr. Koebele and were received, bred and distributed by Mr. Coquillett. He received the first importations of *Novius (Vedalia) cardinalis* in 1887 and in the following year commenced to distribute this important Coccinellid enemy of the Scale. He acted as field agent of the United States Bureau of Entomology until 1893 when he joined the staff of the Bureau and he remained an active member of it until his death.

In 1896 he was made Honorary Custodian of the Diptera in the United States National Museum and this was only in accordance with the nature of his work which was now of a systematic character. His knowledge of the Diptera of North America and his intimate acquaintance with the very diverse families of this difficult order, to which his published works testify, gained for him not only a continental but a world-wide reputation. Students of North American Diptera will feel his loss exceedingly.

His connection, as a contributor, with THE CANADIAN ENTOMOLOGIST is of more than ordinary interest, as he contributed, I believe, more papers to this journal than to any other scientific periodical. A paper "On the early stages of some Moths," published in 1880, in Volume 12, was one of his earliest scientific papers; it may have been his first. His first paper on Diptera was "On the early stages of the Dipterous Fly *Chrysophila foeda* Loew.," published in 1883, in Volume 15. His last contribution was made in February last, and I have a happy recollection of a conversation I had with him when visiting Washington in April. Little did I think that we should be deprived so soon of one who for over thirty years had contributed to these pages, and was ever ready to assist us in the study of Canadian Diptera.—C. GORDON HEWITT.

TACHINIDÆ, NEW AND OLD.

BY W. R. THOMPSON, ITHACA, NEW YORK.

(Continued from Vol. XLIII, p. 272.)

Acronarista mirabilis Town.

This species was described by Mr. Townsend (in Tax. Musc. Flies, p. 86), from a single specimen collected by Dr. H. G. Dyar at Palm Beach, Fla. The type specimen seems to be a male, not a female. In the genus *Schizotachina* and related genera, of which this is one, the secondary sexual characters, such as holopticism, the absence of orbital bristles, and long claws and pulvilli in the male sex, are not apparent. The only certain method, therefore, of determining the sex of a specimen is by an examination of the genitalia. The close relation of the genus *Acronarista* to *Schizotachina* would seem to indicate that the incised third antennal segment is in itself likely to be characteristic of the male sex, and an examination of the genitalia of *Acronarista* has confirmed this view.

The males of the two genera may be separated as follows :

Arista inserted at two-thirds the distance from base to apex of third antennal segment ; palpi cylindrical, quite small. *Acronarista* Town.
 Arista inserted close to the base of the third antennal segment ; palpi well developed, often more or less broadened and flattened. *Schizotachina* Walk.

Metopia Meigen.

Among a number of Tachinids collected in the neighbourhood of Boston, Mass., I found a number of specimens which I at first thought to be females of *Metopia leucocephala* Rossi. An examination of the genitalia, however, showed that both sexes were present, and upon more careful study I found good characters for the separation of both males and females from those of *leucocephala*. The specimens were submitted to Mr. Coquillett, who determined them as *Metopia lateralis* Macquart. This species was described by Macquart in Dipt. Exot., Sup. III, p. 208 (48), 1847, as *Degeria lateralis*. The species was placed by Mr. Coquillett as a synonym of *M. leucocephala* in his "Revision." Only females were in the U. S. N. M. collection, and these differ so little from the females of *leucocephala* that their separation did not seem warranted. The species may be separated by the following key :

1. Frontal vitta and parafrontals dark brown on posterior half, somewhat polished, parafrontals very thinly dusted with silvery-pollen on the anterior half and apparently including the frontal vitta, shining

silvery-white; the parafrontals converge rapidly from the vertex, meeting at the line separating the posterior and anterior halves of the front, the triangular frontal vitta apparently ending acutely at that point, continued to the base of the antennæ as a scarcely perceptible median line separating the parafrontals, which almost fusing along this line form a median carina on the anterior half of the front; parafacials and cheeks silvery; the rows of cruciate frontal bristles interrupted across the anterior half of the front, from the apex of the frontal vitta to the base of the antennæ; a row of six or seven upwardly curving bristles extend from the base of the antennæ to a point a little below the arista; front projecting in front of the eye a distance about equal to the horizontal diameter of the latter as seen from the side; front narrowest at vertex, broadening anteriorly; the inner margin of the eye, as seen from in front, concave, more distant at middle than below; legs black, sides of the abdomen not reddish-tinged; third abdominal segment with only two median marginal macrochætæ. Male.....*M. leucocephala* Rossi.

Frontal vitta dark brown, sometimes dusted with silvery pollen, but diminishing only slightly in width from vertex to base of antennæ, parafrontals never approximated on anterior half of front to form a median carina; front flat, parafrontals widely separated from vertex to base of antennæ; the rows of cruciate frontals not interrupted on the anterior half of the front; parafacials and cheeks thickly silvery-white pollinose.....2.

2. Front projecting in front of eyes a distance equal to three-fourths the horizontal diameter of the eye, as seen from the side; frontal vitta from one-fourth to one-third the width of the front; frontal vitta dark brown, sometimes thinly dusted with whitish pollen, at times wider at vertex than on the anterior part of the front, parafacials never approximated to form a median carina, the front flat; legs black; abdomen not reddish-tinged; third abdominal segment with only two median marginal macrochætæ. Female...*M. leucocephala* Rossi.

Front projecting in front of eyes a distance equal to one-fourth to one-third the horizontal diameter of the eye, as seen from the side; frontal vitta from one-half to three-fifths width of front; front broadest at vertex, narrowing anteriorly; the inner margin of eye, as seen from in front convex, more distinct below than at middle; legs and sides of abdomen often largely reddish; third abdominal segment with a row of 6 or 7 strong marginal macrochætæ.....*M. lateralis* Macq.

Gædiopsis Brauer and von Bergenstamm.

I have been unable to determine certainly whether any of the specimens in the U. S. N. M. collection are referable to *mexicana* B. and B. I find that the specimen originally determined as *mexicana* by Mr. Coquillett (in "Revision of Tachinidæ," p. 136), is identical with specimens described by him later under the name *ocellaris* (in Proc. U. S. N. M., XXV, 118). The specimens which he subsequently determined as *mexicana* have been separated by Mr. Townsend into two species, *sierricola* Towns. and *organensis* Towns., which he described as new in the "Taxonomy of the Muscoidean Flies," p. 93. It is very difficult to say which of these forms is the true *mexicana*, and pending comparison of specimens with the type the names may as well be left as they are. Mr. Townsend's two species are, at all events, exceedingly closely allied, but a larger series is necessary in order to determine the limits of variability of the species.

The genus *Poliophrys*, proposed by Mr. Townsend (*loc. cit.*, p. 90), for these species, certainly cannot be maintained in view of their undoubted close relationship to *mexicana*, which is the type of *Gædiopsis*. Mr. Townsend gives no characters for the separation of his genus from *Gædiopsis*, and I have been unable to discover any.

The following key to the North American species, based upon the specimens in the U. S. N. M. collection, may be of service. The type specimen of *Gædiopsis monticola*, described by Mr. Townsend from one male specimen collected in the Organ Mts., New Mexico, has been examined by Mr. Coquillett, who informs me that it is the same as *setosa* Coq.

1. Legs black or tinged with rufous, at most with the tibiæ reddish . . . 2.
 Legs, except the tarsi, yellow; tarsi dark brown; first abdominal segment without marginal macrochætæ; no ocellar bristles; third arisal segment from about one and one-half (males) to about three times (females) the length of the second segment; several macrochætæ and a number of strong bristly hairs on the parafacials. Length, 7.5 mm *G. flavipes* Coq.
2. Third arisal segment not over one and one-half times the length of the second segment; parafacials without macrochætæ or strong bristly hairs, near the lower corner of the eye on the outer part of the parafacials with only a cluster of fine hairs, which extend along the parafacials for less than one-half of the distance from the level of the vibrissæ to the lowest frontals; with one or two similar fine hairs below the lowest frontals; parafacials otherwise bare; ocellar bristles strong; fourth segment of the abdomen, except the base, red,

somewhat polished, thinly grayish-pollinose; only marginal macrochætæ on second and third abdominal segments, none at all on first segment. Cheeks not over one-fourth the height of the eye.

Length, 9 mm. *G. facialis* Coq.*

Third arisal segment not less than twice the length of second segment; parafacials with a row of macrochætæ or strong bristly hairs, and between these and the eye rows of weaker hairs, these extending from the cheeks up to the lowest frontals. Ocellar bristles present or absent. First abdominal segment bearing marginal, remaining segments bearing marginal and sometimes discal macrochætæ. . . . 3.

3. Abdomen and mesonotum grayish pruinose or pollinose; the mesonotum with darker vittæ, the abdomen with dark-reflecting spots. . . . 4-

Abdomen, as viewed from above, dark brown, somewhat polished, with out grayish pruinosity or pollinosity; mesonotum, as seen from above, thinly grayish-dusted, with darker vittæ only on the anterior part, the remainder of the mesonotum and the scutellum appearing somewhat polished, the scutellum dark reddish; first two abdominal segments on the sides reddish, the first three segments with strong marginal macrochætæ, the second and third with short erect bristles, intermingled with which are sometimes discal macrochætæ; ocellar bristles present or absent; species having a superficial resemblance to *Blepharipeza leucophrys* Weid. Length, 11 mm. *G. cockerelli* Coq.

4. Second and third abdominal segments with discal macrochætæ. . . . 5.

Second and third abdominal segments without discal macrochætæ. . . 6.

5. Ocellar bristles not developed; sides of front more or less strongly tinged with reddish, in certain lights appearing somewhat polished, thinly pruinose; scutellum red, polished, thinly grayish-dusted; abdomen in the male with the sides broadly reddish, the fourth segment black or reddish tinged, somewhat polished, only thinly grayish-dusted, second and third segments with strong discals in both sexes. Length, 12 mm. *G. setosa* Coq.

Ocellar bristles developed, strong, proclinate; sides of the front opaque, densely yellowish-pollinose; scutellum blackish at base, only slightly

*In the single specimen of this species (the type, male) in the U. S. N. M. collection, only the large scars of the ocellar bristles remain. That the specimen once possessed well-developed ocellar bristles there can be no question; in the description of the species, however, nothing is said in regard to the direction of the bristles, so that it is not certain that they were present when the specimen was received by Mr. Coquillett. In view of this fact and the singular divergence from the typical generic character presented by this species in the almost bare parafacials, its generic position must remain to a certain extent in doubt until perfect specimens are secured.

- polished, grayish-pruinose ; sides of the abdomen only very slightly reddish tinged, fourth segment densely yellowish-pollinose, not polished, the colour of that segment contrasting somewhat with the colour of the remainder of the abdomen, which is more bluish-gray ; second and third segments in the male each with a pair of weak discals, in female there is but one of these on the second and a pair on the third segment. Length, 9 mm. *G. sierricola* Town.
6. No well-developed ocellar bristles ; fourth abdominal segment densely covered with yellow pollen, its colour contrasting strongly with that of the remainder of the abdomen, which is bluish ; face and front like fourth abdominal segment, yellowish-pollinose, and when viewed from the side a brown-reflecting spot of greater or less extent appears below the lowest frontal bristles. Length, 9 mm. The species superficially resembles *Exorista futilis* O. S. *G. ocellaris* Coq. Ocellar bristles strong, proclinate 7.
7. Fourth abdominal segment concolorous with the preceding segments ; the abdomen grayish, brassy-pollinose, with blackish reflections ; parafacials densely bluish-pollinose, the pollen of the front slightly tinged with golden. Length, 8-10 mm. *G. organensis* Town. Fourth abdominal segment yellowish-pollinose, its colour contrasting somewhat with the remainder of the abdomen ; second and third abdominal segments with weak discal macrochætæ ; pollen of face and front yellowish. Length, 9 mm. (See under No. 5) *G. sierricola* Town.

Mr. Coquillett has kindly furnished me with the locality records for these species, which are as follows :

G. flavipes Coq.—Tifton, Ga., and Opelousas, La.

G. facialis Coq.—Georgia (type).

G. cockerelli Coq.—White Mts. (type), and Las Cruces, N. Mex.; Chisos Mts., Brewster Co, Texas, and Sierra Madre, Chihuahua, Mex.

G. setosa Coq —Siskyou Co., Cal. (type) ; White Mts. and Rio Talarosa, N. Mex., and Sierra Madre, Chihuahua, Mex.

G. sierricola Town.—Sierra Madre, Chihuahua, Mex.

G. ocellaris Coq —Ohio (type) ; Angora Fern Rock and Philadelphia, Pa., and Franconia, N. H.

G. organensis Town.—Organ Mts., New Mexico (type).

From these records it seems that *ocellaris* is a northeastern species, *flavipes* and *facialis* are southern central forms, and all the others are southwestern species.

ON *CEA IMMACULA* AND ALLIED SPECIES.

BY WM. BARNES, M.D., AND J. MCDUNNOUGH, PH.D., DECATUR, ILL.

In sorting over material from Arizona and the southwest we have come across four species very similar in outward appearance, but structurally widely different. Two of the species are fairly well known, but the other two are apparently undescribed.

The first species before us is *immacula* Grt.; (not *immaculata* as given in Dyar's List), the type of the genus *Cea*. The species was originally described from Arizona, but our series of some twenty specimens all come from Deming, N. Mex. It may be recognized by its immaculate creamy-white primaries, which in very few cases show faint traces of t. a. and t. p. lines and reniform. The legs are unarmed, with neither spines nor claws; the front possesses a fairly prominent rounded protuberance with a distinct corneous infra-clypeal plate. According to Hampson (Cat. Lep. Phal., IX, 280), who, however, does not know the species personally, the protuberance is bare of scales; this, however, does not apply; with the exception of a small black point in the centre of the same, it is thickly covered with closely-appressed scales, of a slightly darker ochreous tint than that of the surrounding area.

The second species under consideration is *luxa* Grt., described from specimens taken by Prof. Snow in N. Mexico, and made by Grote the type of a new genus, *Bessula*. In Dyar's Catalogue this species is placed close to *immacula*, but Hampson separates it very widely, placing it at the very beginning of the *Noctuidæ* in his subfamily *Agrotinæ*, characterized by spined tibiæ of middle and hind legs; *luxa* is placed in the genus *Schinia* Hbn., of which *Bessula* is made a synonym. Besides spined middle and hind tibiæ, *luxa* possesses on the fore tibiæ a strong curved claw on the inner side, preceded by two minute spines, which often appear wanting, owing probably to breakage; further, on the outer side of the tibiæ, is a row of three claw-like spines, the largest being at the extremity of the joint. The front is rounded, scarcely as full as in *immacula*, with appressed scales without the central black point, and the infra-clypeal plate is present. In general appearance *luxa* is yellower than *immacula*, and may at once be distinguished by the light-brown dotted t. p. line, the cellular dots and the dots at the base of the fringes. As in many cases these show a tendency to obsolescence, structural characters are of great value in separating the species. The sixteen specimens before us are from So. Arizona.

September, 1911

The third species is at first sight very easily confused with *luxa*; a glance at the tibiae will suffice, however, to separate it, for they are all unarmed, as in *immacula*. The front has a large corneous heart-shaped process with raised edges and the infra-clypeal plate is very distinct. Although differing considerably in outward appearance from the species at present included therein, it seems to belong in the genus *Oslaria* Dyar. As it appears to be undescribed, we would propose the name *pura* for it, and append following description:

Oslaria pura, n. sp.

Front, thorax, abdomen and primaries creamy-white; t. a. and t. p. lines faintly outlined in brown; the former from costa at $\frac{1}{3}$ from base, irregularly dentate, with two darker brown dots at intersections of median and anal veins; the latter well beyond reniform, midway between it and outer margin, parallel with margin, slightly dentate and with darker brown dots at intersection of veins; orbicular and reniform outlined in brown; former small, round; latter large, constricted in middle, and connected with inner margin by faint brown shade; on costa between orbicular and reniform a slight brown shade; fringes but slightly darker than wings; secondaries pure white.

Beneath white shaded with brown towards apex of primaries and with indistinct postmedial band on same. Expanse, 28 mm. Described from 5 ♂s, 10 ♀s. Christmas, Gila Co., Ariz. Types, Coll. Barnes.

The above description was made from a clearly-marked specimen. There is a great tendency for the maculation to become indistinct, especially in the males, leaving only the dots at intersection of veins distinct. In one ♀ specimen there are traces of a dotted median line on secondaries.

The fourth and last species belongs in the group with unarmed tibiae; its frontal structure is that of the genus *Lythrodus* Sm., consisting of a corneous protuberance with raised edges, containing a prominent vertical plate; infra-clypeal plate is present; the fore tarsi are also shot, with large terminal claws, agreeing in this respect with Smith's characterization of the genus. It differs greatly from *L. radiata* and *venosa*, but seems to approach more closely *semiluna* Sm. in general appearance. We propose to call it *tripuncta*, with following description:

Lythrodus tripuncta, n. sp.

Head, thorax and wings white, primaries suffused with light brown, especially in median and subterminal areas. A small brown basal dot,

situated in slight brown shade; t. a. line broad, brown, angled twice inwardly, almost straight across wing; t. p. line brown, slightly dentate in upper portion, strongly outcurved just below costa, incurved somewhat opposite reniform, strongly incurved below same to inner margin, where a slight outward angle is formed; orbicular represented by a brown dot; reniform by two brown dots, situated at either extremity, placed vertically to each other; from just beyond orbicular to t. p. line the median area is largely suffused with light brown; beyond the t. p. line is a narrow band of white, the remainder of the subterminal area washed with brown; subterminal line represented by a white, irregular, dentate band, beyond which the brown shading again obtains; fringes white, tinged with brown at extremities. Secondaries white.

Beneath primaries smoky-brown, whitish along inner margin; secondaries white, tinged with brown along costal margin and with traces of a brown postmedial line. Expanse, 28 mm.; 2 ♂s, 2 ♀s; Redington, Ariz.; Babquivera Mts., Ariz. Types, Coll. Barnes.

The three brown dots representing respectively orbicular and reniform are quite characteristic. The ♂ specimens are in very poor shape, but the ♀ is well preserved; the description has been drawn from the latter.

PREDACEOUS BUGS.

A very remarkable occurrence of predaceous bugs has taken place in Southwestern Ontario during the last few weeks. Correspondents in the counties of Dufferin, Norfolk, Oxford and Middlesex have sent in specimens of *Perillus bioculatus* Fabr., and of its variety, *claudus* Say. The latter form was described and figured in the Second Annual Report of the Entomological Society of Ontario, published in 1871, under the name of *Perillus circumcinctus*. These bugs, both in the imago and nymphal forms, are destroying the Colorado Potato Beetles, both eggs, larvæ and mature beetles, to such an extent that in some fields it is reported that hardly any of the beetles are to be found, though the plants have not been sprayed. They are quite abundant also at the College in Guelph and other parts of the County of Wellington. The specimens have been kindly identified by Mr. E. P. Van Duzee, of Buffalo, N. Y. He expresses surprise at the species being found in this part of Ontario, as he considers it a southern form, and is rarely known to be found as far north as the State of Illinois. It is to be hoped that the insect may continue prevalent and keep the Colorado Potato Beetle in control.—[C. J. S. BETHUNE.

ERRATUM.—P. 286, line 7, for "*poliachroa*" read "*poliochroa*."

FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MILLARVILLE, ALTA.

(Continued from page 286.)

186. *O. cibalis* Grt.?—Sir George Hampson makes the Calgary form "Subspecies 1 of *cibalis*, describing it by comparison: Thorax and fore wing grayer, the latter more uniform, and without the whitish patches in the interspaces; the dentate black marks before subterminal line more developed between veins 6 and 2; tegulæ produced to a dorsal ridge." He figures as typical *cibalis* a male from Glenwood Springs, Colo. The figure shows a strong rufous brown shade over a large portion of the primaries, which, however, he does not mention in the description. I compared the specimen with his figure, and made no criticism upon the latter. Moreover, I have a good series from Eureka, Utah, which fit the figure perfectly.

My note on Prof. Smith's material reads: "Utah and Colo. specimens are more pale streaked than my form, but one from Colo. grades in." This is in accordance with Hampson's diagnosis, nor do I seem to have observed brown shades shown in his figure and in my Eureka series. At Washington I wrote: "One 'Colo.' and one 'Glenwood Springs' are like Hampson's figure. But two Denver males, one of them labelled 'W. S. Foster,' are exactly like Calgary specimens here, and I should say these are almost certainly two species." My own Calgary and Utah series suggest the same, very strongly. But which is *cibalis* remains to be discovered, as I have not seen Grote's description, and the type, which Prof. Smith's Catalogue states to be from Colorado, and in the Graef. collection, I appear to have overlooked. Holland's figure represents the Calgary form (which also occurs in Manitoba) exactly. The origin of the specimen figured can only be surmised by his statement on page 176: "The only specimens so far have been taken in Colorado."

187. *Rhynchagrotis gilvipennis* Grt.—Prof. Smith in his "Revision of Agrotis" places *gilvipennis* first in his then new genus *Rhynchagrotis*, considering it, it is to be supposed, the most typical, making our species a synonym of *chardinyi* Bdv. He remarks on page 14: "Mr. Grote first stated that the fore tibiæ in his specimens were spinose, but I have never been able to discover any." In his reference to *chardinyi* he merely follows Morrison and Grote. In his Catalogue he corrects this and makes *gilvipennis* a good species. Sir George Hampson places most of our species of *Rhynchagrotis* in *Triphana* Hübn., but retains Smith's genus for

chardinyi and *gilvipennis* exclusively, describing it, as Smith did, as a genus having unspined fore tibiae, and quoting *gilvipennis* as the type. He had only three specimens of this at the time of publication, including the male type from Anticosti, which is well figured. I did not examine the specimens structurally. Recent investigation has disclosed the fact that, at Calgary at least, fore tibial spines are quite frequent in this species. In two of my specimens I can, without recourse to laying the vestiture, easily see five spines on the inner side. In many others I can find from one to five, with varying degrees of prominence, though in some I can find no trace of any, even by laying the hairs with gasoline or alcohol.

I have only two specimens of European *chardinyi*, and can detect no spines on fore tibiae of these, though they will require careful re-setting before they can be examined to advantage.

I have not yet investigated very fully in other species referred by Prof. Smith to this genus, but have succeeded in discovering a single spine on the fore tibiae of two Kaslo specimens out of a series of *confusa*, beneath, and just in front of the epiphysis.

Within the past year I have observed enough about the apparent occasional variability of tibial spines to make me desirous of a more thorough investigation. In order to do this, I should like to discover some effective method of entirely removing hairs and scales without injury to spines or spurs. I shall be very grateful for advice on this subject (*vide* recent exchange notice). The matter is important, as some genera as used by Sir George Hampson rely, for their existence in Vol. IV, on the existence of a single tibial spine!

189. The specimen here referred to is the species widely known as, and figured by Holland and Hampson as *alternata*. I have never taken another Alberta specimen that I know of, though it is common in Manitoba.

190. *Rhynchagrotis placida* Grt.—I have no good reason for supposing that I have confused more than one species under this name at Calgary, and I appear to have it correct. Some of the forms in this genus are more difficult to understand than some of the most variable Euxoas, but I feel sure that there are more names on the list than known species. Hampson places most of our species in the genus *Triphæna* Hübner.

192. Sir George Hampson's remark before quoted under this head is interesting, as Prof. Smith subsequently described the form, from a single male I had sent him some years before, as *Aplectoides fales* (Journ. N. Y.

Ent. Soc., XIII, 192, Dec., 1905), that being the genus to which Hampson refers *pressa* and most of our *Platagrotis*. The description adds: "It is a broad-winged form more like *imperita* than *pressa*, and yet not unlike an obscurely marked *pressa*. . . . This may be really the male of *discolor*," and *discolor* is next described from two females from "Inverness and mouth of Skeena River, B. C." The types of the latter struck me as being like a white-grounded *pressa*. The suggestion that they may be sexes of one species seems quite reasonable. It may take more material from Northern B. C. to decide the matter, but if they are I would suggest further that the differences are not necessarily sexual. I can suggest nothing further about *discolor* for the present, but I believe *fales* to be merely a dull grayish *pressa*. I have specimens from Montreal, Ottawa, "E. Ontario," Cartwright, Man., and Kaslo, besides four from Calgary. Some eastern specimens are quite as gray as the local series, and they grade through in colour and everything else to the greenest. The type of *pressa* is a female from New York, but Hampson figures a male from "Canada." As a Calgary and California specimen stood in the British Museum I admit they looked distinct from the *pressa* series from New York and "Canada," but I quite failed to draw any line between the two series in Prof. Smith's collection. Nor can I agree that *fales* resembles *imperita* in that collection as much as it does typical *pressa*. The form should stand as *pressa* var. *fales*.

193. *Euretagrotis inattenta* Smith.—I have a good series taken locally and specimens from Cartwright and Miniota, Man., and Windermere, B. C. I have also a series of *perattenta* from Montreal and Ottawa. The eastern specimens are, as a whole, a bit brighter coloured and have the maculation more clearly written, and all the black markings a little heavier. I have one Calgary male, however, and have compared a similar one from Redver's, Sask., from Mr. Crocker, which resembles some eastern specimens almost exactly. I have local specimens grading almost exactly up to this. I hesitate to make the reference definitely at present, but have little doubt that the forms will be ultimately found to unite. I have seen a series in Mr. Cockle's collection at Kaslo which my notes say resembled the eastern rather than the prairie form, but have none from that locality in my collection. I have one from Vancouver Island which is certainly nearest the eastern form, but much brighter in colour, almost vinous red. My local dates read from June 24th to August 2nd, and it is occasionally not uncommon at both treacle and light. The type of

perattenta is a male from Evans Centre, N. Y., and is a very strongly marked specimen.

194. *Pachnobia littoralis* Pack.?—The Calgary species so referred is certainly *pectinata* Grote, of which the male type from Hall Valley, Colo., is figured by Sir George Hampson. I have a male from the type locality, from Dr. Barnes. I have not seen the type of *littoralis* from Caribou Island, Labrador, and therefore cannot directly dispute Prof. Smith's reference to that species. But if the description given in his Revision of *Agrotis* (Bull. 38, U. S. N. M., p. 205), is the original one of Packard, I do not feel sure of its identity. He describes what must be the t. a. line as "black, irregularly quadridentate." In some of my specimens the line might be called quadridentate, but in none that I have seen is it anything approaching to black. Then again, beyond the t. p. line is "a parallel line of dark streaks of uniform length," and beyond this again, the s. t. line. The line of dark streaks beyond the t. p. is non-existent in any of my specimens. Such variation is not impossible, but the above are two characters new to me.

196. *Agrotis aurulenta* Smith.—Another ♂ at light, July 23rd, 1905.

201. *Peridroma margaritosa* Haw.—It has long been a puzzle to me to know why *saucia* is the only varietal name standing in our lists for this very variable and somewhat ubiquitous North and South American, European, and Asiatic species. I have a good series from Calgary, Vancouver Island, and Stockton, Utah, and have seen numerous others. On this continent the species has an infinitely wider range of variation than the names *saucia* and *margaritosa* signify. Two names, *inermis* Harris, and *ortonii* Pack., stand in our lists as synonyms of "var. *saucia*," whether quite correctly or not I cannot say. Sir George Hampson lists nine other names as synonyms, though some of them I believe were described from North American material. If *saucia* was, that may account for the retention of the name on our lists to the exclusion of others. Hampson, after describing *margaritosa* as "brownish ochreous, irrorated with brown, lists 'Ab. 1' without name as: Fore wing dark brown, costal area, orbicular, subterminal area, and an apical patch gray, and 'Ab. 2,' *saucia*, . . . much more uniform gray-brown." Tutt, in "British Noctuae and Their Varieties," II, p. 5, 1892, lists eight varieties as British, including four of his own naming. He summarizes a description of Hübner's figure of *saucia*, which constitutes the type, as "blackish-gray,

with vinous-red costa." This does not quite tally with Hampson's *saucia*, though I have Calgary specimens fitting both. Tutt gives the original Latin description of Haworth's *margaritosa*, which was described as a distinct species. The colour description reads "*alis grises cinereis nebulosis*," which Tutt sounds right in translating "wings gray, clouded with ashy," but which is again at variance with Hampson's general description and sounds more like his *saucia*. I have a Calgary specimen which fits it beautifully. In addition to these, our species varies through many shades of gray, ochreous brown and vinous red; and specimens may be very uniform, or have the costal region either much the palest, or much the darkest part of the wing, or with various mixtures of shades. The way the names stand in our lists suggests either that *saucia* is the North American form of *margaritosa*, or that it is a well marked extreme form occurring with us as well as the type, whereas it merely represents one phase, and a by no means striking one, of a long range of variation. It is inexplicable why *saucia* should be retained in our lists as a variety, whilst such strikingly unlike forms of *ochrogaster* as *gularis*, *turris*, and *insignata* (as instances amongst many), be passed as mere synonyms.

202. *Noctua baja* Fabr.—This species is listed as *smithii* Snellen, in Prof. Smith's Check List, 1903, on the authority of Snellen, whom I also followed. It was claimed by its author that our North American form had spined fore tibiae, whereas that occurring in Europe, although superficially almost exactly like ours, had not. (Smith, in Journ. N. Y. Ent. Soc. VI, 99, 1898). Dr. Dyar erred in omitting any reference to *baja* whatever in listing our species as *smithii* in his Catalogue. But in the Kaslo List he restores the old name, remarking: "An examination of European specimens shows them to have several distinct spines toward the tip of the member, well hidden in the vestiture." I have lately carefully examined fourteen British specimens of *baja*, and find spines on the inside tibiae of seven. In a few of these I can find a single spine only, just at the tip; in others there are three or four, rather obvious. As a rule the vestiture on tibiae of my British specimens seems rather thicker than in most of the North American series, but not constantly so. Whether spines are merely concealed or absent from the rest I cannot say. The fore tibiae of most of my native *baja* are not in a position to permit of careful examination, but spines appear to be rather obvious in most of those that are, in varying numbers up to five. In one, at least, in which the tibiae are well

spread, I can detect none. Even if their existence is not a variable character, their prominence most certainly is, on both continents, and *smithii* must be dropped. Sir George Hampson makes it a synonym.

204. *N. patefacta* Smith.—Sir George Hampson treats *juncta* as distinct, figuring the male type from Nova Scotia. It has head and thorax paler than the wings, and collar still paler tipped. I have seen no other specimens like it. The wings are paler than the average run of *patefacta*, but they are pretty obviously faded, as Grote says it resembles *treatii* in its "dead black primaries." The type was a unique, taken by and received from Mr. Roland Thaxter, and is badly rubbed. I have one *patefacta* almost as dark as most *treatii*, and they vary to as pale as Hampson's figured *juncta*. In one of my specimens the spots do not join on one side, and scarcely so on the other. But in all the thorax is unicolorous with primaries, though the tip of the collar is sometimes appreciably paler. Their distinctness from Grote's species is perhaps a doubtful point, but, as Sir George Hampson thinks, they may as well be kept apart, pending the discovery of more specimens from Nova Scotia, or thereabouts. There are two specimens of *patefacta* from Yellowstone Park in the American Museum of Natural History.

205. *N. cynica* Smith, var. *perumbrosa* Dyar.—I took several specimens of this form on the wing after dark and at treacle between July 31st and August 15th, 1909, and conclude that it is correctly named. I have a Kaslo series, some of them co-types, and have seen about thirty co-types at Washington, besides the type of *cynica*, which seemed a paler form of the same species. Prof. Smith states under his description of *cynica* that his specimen came from Albany, N. Y. The only type I have recorded having seen is a male at Washington which is labelled "Bailey, /83." It was described as distinct from *rubifera* in being broader winged, lacking a median shade (which it was suggested might not be constant), and having totally different male genitalia. These are shown of both species, and certainly indicate some strong differences.

My Calgary specimens are darker than most seen from Kaslo, and have darker secondaries. Some of the Kaslo specimens are not a bit darker than any of a series of six females that I have from Ottawa as *rubifera*, and look the same. One of the latter is almost exactly like Hampson's figure of *rubifera* female type, noted in the key as a male from New York, but merely labelled "U. S. A." This type he calls

"Ab. 1," it differing from others in having black before and between stigmata, a common phase of variation in this group and allies. A central shade is indicated in the tables, but not mentioned in description or shown in figure. It is a still more common phase of variation in allied species. It seems that there is really nothing tangible to separate *cynica* from *rubifera* unless by the male genitalia. I should like to see a good series of figures from males of both from the same locality.

(To be continued.)

COLLECTING NOTES FROM CARTWRIGHT, MANITOBA,

We have had and suffered somewhat from a Yankee invasion in this neighbourhood. A swarm of *Cantharis nuttalli* has come north out of Dakota, and done some damage in gardens about Cartwright. A neighbour of mine, an Englishman, has had all his broad beans eaten by them. So the poor fellow will have no "beans and bacon" this year. He is an advocate of reciprocity, so I tell him he has no cause to grumble. It is only what he may expect, and things much worse, if that very one-sided arrangement is carried into effect.

This *Cantharis*, I may add, used to be rather abundant on the unbroken prairie in my early days. It fed upon one of the vetches. I forget its botanical name, but it is locally called the "buffalo bean." It was a lovely sight to see two or three of them on the vetch flowers in the bright sunshine, shining like emeralds shot with purple.

In my early days *Pieris protodice* was the common "white" of the prairies. I am speaking of the "eighties." As *rapæ* reached here *protodice* gradually disappeared, and for years I have not seen a specimen. On July 12th, when walking through a scrubby corner of my pasture, I netted a "white" that came past me, killed it, thinking it was *rapæ*, and was turning it out of my net when, to my surprise, I found it was a *protodice* ♀. Since then, about the same place, I have seen a second.

A few nights on and after June 20th were favourable for collecting at light, and I made some interesting captures on my windows and in my trap, which will appear in Mr. Arthur Gibson's record. One curious thing I noticed was that every night at 12 o'clock, as punctually as possible, *Belostoma americanum* began to come to the light, and kept me busy catching and killing them, as these great water-bugs, banging about the window, drive away many desirable moths.

The Hermitage, near Cartwright, Manitoba.

July 18th, 1911.

E. FIRMSTONE HEATH.

THE George Washington University has conferred the honorary degree of Doctor of Medicine on Dr. L. O. Howard, Chief of the Bureau of Entomology and Permanent Secretary of the American Association for the Advancement of Science, for "distinguished services to science in relation to preventive medicine."—[*Science*.

BOOK NOTICE.

ANNUAL REPORT OF THE NEW JERSEY STATE MUSEUM, including a Report of the Insects of New Jersey, for 1909. Prepared under the direction of Prof. John B. Smith, State Entomologist.

The first edition of the "Insects of New Jersey" was published in 1890 and a second in 1900. As the latter has long been exhausted, and as there has been so much demand for it, the present one was issued in 1910. It contains the Curator's Report, followed by :

Part I.—Treating of insects, their classification and distribution. This is divided into four chapters, which give a good general account of the classification, development and faunal characteristics of insects, and of the benefits and injuries caused by them.

Part II.—Comprising a systematic list, embracing twenty-two orders of insects. Each order is characterized and a general account given of the habits of its members, whether beneficial, injurious or of no material economic importance. The families in general are similarly treated. Illustrations numbering 340, of which many include from two to eight figures, are interspersed throughout.

The present edition contains records of 331 families, 3,486 genera and 10,385 species, the list of species being 1,845 in excess of the previous list, and 4,287 of the early one. The localities of most of the species are given, together with the dates of appearance, habits in the various stages, and food-plants ; thus making a volume that is of inestimable value to all classes of entomologists, nature students and collectors, and the only work covering such a broad field of entomology that has been published by any State of the Union or by any public or private institution.

The Report is also furnished with indices to localities and to families and genera, and a coloured map shewing the faunal regions of the State.

J. D. E.

The Canadian Entomologist.

VOL. XLIII.

LONDON, OCTOBER, 1911.

No. 10

FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MILLARVILLE, ALTA.

(Continued from page 327.)

209. *Noctua rosaria* Grt.—I consider this identical with European *rubi* Viewag. In my earlier collecting days in Alberta I seemed to recognize in what I was taught to call *rosaria*, the familiar *rubi* so common nearly everywhere in England. I noted them as probably identical after studying the British Museum material in 1909, and have now European and Calgary specimens in my collection which match exactly. The late C. G. Barrett claims that they are identical in his "Lepidoptera of the British Isles" (IV, p. 90), though in many cases his associations of European with North American species are unjustified. Sir George Hampson keeps them distinct, ascribing to *rosaria* in the table dark streaks on the veins, stated to be lacking in *rubi*. This is a variable character in *rosaria*, of which, besides a long local series, I have three from Kaslo and over thirty from Vancouver Island.

Sir George Hampson still confuses Calgary specimens of *rosaria* with *calgary* Smith. Long familiarity with both in a state of nature would doubtless obviate this. They seem quite easily separable, and the differences pointed out in my former notes hold, except that I have since occasionally found *rosaria* with black in the cell.

A much nearer ally of *rosaria* is *perumbrosa* Dyar. Though there can be no doubt of their distinctness, the differences are hard to express in words. *Perumbrosa* and its eastern ally, *rubifera*, as I understand it, have varying shades of red and brown, but entirely lack the rosaceous tint of all *rosaria* that I have seen. The colour is also much more even throughout, whereas in *rosaria* the submedian and subterminal spaces are usually slightly, though rarely contrastingly, paler than the rest of the wing. The cross lines in *perumbrosa*, though indistinct, are finer and less diffuse. Structurally the thorax and abdomen are less robust, and the fore wing has both costa and hind margin more rounded.

210. *N. calgary* Smith.—I am not in a position to make the reference at present, but it seems to me not improbable that this will prove identical with *esurialis* Grote, which certainly has no nearer ally known to me on this continent. The type of the latter is a male in the British Museum from Washington State, and is a good specimen, except that it lacks antennæ. It is well figured by Hampson, only the specimen is really a bit more even in colour, and the oblique orbicular a little more open. There are no other specimens in the collection under the name.

Esurialis has at times been associated with both *jucunda* and *rosaria*. Both these associations I seem able to explain. There are, in the British Museum, three *Anticosti* specimens which have long been associated with *jucunda*, and which are referred to by the late J. W. Tutt in "British Noctuæ and Their Varieties" (IV, p. 16 of the introduction). These specimens I should call *calgary*, as well as a male in the same series labelled "U. S. A., Grote collection." *Calgary*, too, has often been confused with *rosaria*, as witness my own confusion in former days, and Sir George Hampson's more recently. In the "Kootenai List" Dr. Dyar seems to suggest that *esurialis* is *rosaria*. What he had for comparison as true *esurialis* I do not exactly know, but it was probably a confusion of *rosaria* with *calgary* over again. I have no note of having anywhere seen *calgary* from Kaslo, though it probably will be found there. But *esurialis* is not *rosaria*. In the Washington collection I found about a dozen specimens standing under *Pachnobia carnea*, from Popoff Islands, Alaska (July 16th, 1899), which seemed to me to be *Noctua calgary*, one of which was almost exactly like Hampson's figure of the type *esurialis*.

211. *N. dislocata* Smith.—More of this species have come to hand, including females that I feel quite certain of, though only one of this sex now remains in my own collection. I feel convinced of its distinctness from *calgary*, and cannot improve upon my former diagnosis of the species. But Prof. Smith's ♀ type happens to be *calgary*, as I had supposed, the male alone holding good. *Dislocata* appears to occur in Europe, as I have a pair from Northern Finland which differs very slightly from some *Calgary* specimens in being smaller and browner, and having duller secondaries. They were received from Mr. Prout as "*festiva*, var. *conflua* Treit.," but do not agree very well with Treitschke's description as copied by Tutt (Brit. Noct., II, 122), or Barrett (Lep. Brit. Isles, IV, 76). Hampson lists *conflua* as an aberration of *festiva*, "smaller, grayer, duller,

markings less distinct," which, whilst it applies to my Finland specimens, as compared to my British series of *festiva*, mostly from Scotland, is not in accordance with Treitschke's description. Moreover, the Finland male has antennæ similar to those of both *calgary* and *dislocata*, viz., ciliate only, with the joints scarcely marked. The antennæ of my series of *festiva*, fifteen in number, are serrate-fasciculate, though not strongly so. These are nearly all lighter in colour than my series of *calgary*, but besides the antennal differences and slightly rougher vestiture of the British specimens, I see no structural differences. Hampson places *calgary* in *Agrotis*, and *festiva* in *Episilia*, but I cannot see that a generic separation is warranted. In the tables *Episilia* is diagnosed as "head and thorax clothed with hair only," and *Agrotis*, "head and thorax clothed with hair and scales and with more or less developed thoracic crests." A slightly greater development of vestiture in *festiva* I have already referred to, but the admixture of hair-like scales is sometimes present in that species also. The vestiture of the Finland specimens is like that of *dislocata* and *calgary* rather than of *festiva*. It remains to be discovered what the real name of the Finland specimens is. The differences noted, antennal and otherwise, may perhaps prove to be variable and to connect with *festiva*, but I am loth to believe that *dislocata* is otherwise than distinct from *calgary*, and observation of the two in nature supports this view, though they are undoubtedly very closely allied.

216. *N. inopinatus* Smith.—As I before suggested, I see no reason whatever for considering this form distinct from *haruspica*. It is indeed hard to find any species of Noctuid, particularly of an Agrotid, which does not manifest certain phases of variation peculiar to different regions. In a very large number of instances such local forms have been described as distinct species, or perhaps merely as races, and subsequently listed as species without further justification. In some cases, where the variation in one locality does not obviously overlap that from another, there seems no reason why a well marked form should not be designated by a distinguishing name, though it seems arbitrary to designate it as a species. But where, as in the present instance, extremes meet, and the variation in one local series includes that in another, whether specimens in the two actually match or not, it does not seem that a species name for each is justified, and it certainly causes confusion.

I happen to possess only two specimens from New York, the type locality of *haruspica*, but have no reason for considering them distinct from

Montreal and Ottawa specimens, some of which can be mated exactly with some from Manitoba and Alberta. As is usual with certain prairie forms, most from the latter places are rather smaller and less distinctly marked than those from the east, but the differences are not constant. A Kaslo series does not differ, but one from Vancouver Island shows a rather strong gray irroration. in some specimens, though nothing to indicate a distinct species. Incidentally, *haruspica* seems to have been merely a change of name for what Morrison named *unimacula* the previous year, as his name was in use by Staudinger in the genus in Europe. But Staudinger and Hampson both list *unimacula* Staud. as a variety of *plecta*, and Hampson restores Morrison's name, which should now be used for *haruspica*. Grote's type of *haruspica* is in the British Museum, and is presumably also Morrison's type of *unimacula*, though I do not know that for certain.

Whether *sierræ* is a distinct species is doubtful. Hampson ascribes to *inopinatus* an entire orbicular, and an open one to *sierræ*, of which he has the type from the Sierras. This is a variable character in *inopinatus* (= *unimacula*). I have specimens from Colorado and Utah which seem of rather slighter build, and are rather darker in colour, though with secondaries paler basally. A few have an edging of faint yellowish gray scales to the transverse lines, and a fine continuous line of the same colour at the bases of fringes. But two or three of the specimens seem to stand equally well in either series.

218. *N. unicolor* Walk. was described six years previous to *clandestina* Harris, and, following the law of priority, Sir George Hampson justly gives it preference, though the pity is that the change was not made sooner, the synonymy being admitted. Walker's type is a female from Trenton Falls, N. Y. (Doubleday), and is the species universally known as *clandestina*, of which, however, I have not seen Harris's type.

219. *N. haviæ* Grt.—I have occasionally taken more specimens of this here, and have some from High River from Mr. Thomas Baird. I have it from San Francisco, and have had a lot from Stockton, Utah, in which *unicolor* (= *clandestina*) was not included. From the latter locality I have one compared with the type, a male from Nevada, in the British Museum. It was originally described as a variety of *clandestina*, but though closely resembling that, and easily confused with it, its distinctness is universally admitted. In colour it may be generally described as grayer

and more strigate, having in particular a faint grayish streak in submedian interspace, joining the median lines, which seems to be lacking in all *unicolor* at present under examination. The secondaries are even, and uniformly darker. Structurally there is a difference in the abdomen of the female, that of *unicolor* having a pair of sublateral foveas, or plates near the extremity, which are lacking in *haville*. It is by this character that Sir George Hampson separates them in the tables.

221. *Chorizagrotis auxiliaris* Grt.—The type in the British Museum is a female from Colorado, and has blue-gray collar and costa, being the form I had previously standing as *introferens*, and is much like the specimen figured by Holland as *introferens*. *Sorrer* Smith (usually written *soror*, though not as originally published) seems to me exactly the same form, though the separation seems to have been based on the form of male genitalia. *Sorrer* was described from two Montana females from the Hulst collection. There is a type at Washington, and, according to my notes, another in the Brooklyn Museum labelled "Arizona," but as this is at variance with the description, my note needs verifying.

222. *C. introferens* Grt.—The type in the British Museum is a male from Texas with yellowish collar and costa, and is the *auxiliaris* of Smith's monograph and my previous notes, with which I had associated the females of the series with the clearest and most whitish costa. The type is the actual specimen figured by Sir George Hampson as *auxiliaris*, of which he makes it the male, probably correctly. In the figure the costa should really be more even.

223. *C. agrestis* Grt.—The type, also in the British Museum, is a female from Colorado, and is the pale red-brown even-coloured form that I had standing as typical *inconcinna*. The more variegated and distinctly maculate forms formerly held by me as *agrestis* seem correctly associated with this, and I have no reason for suspecting that the Calgary, or any Canadian material that I have seen, includes two species. Nor have I yet succeeded in drawing any line between *agrestis*, *introferens* and *auxiliaris*, and suspect that they are all one. A few years ago I confined a large number of females over various herbage to try and induce them to lay, but without success.

[224. *C. inconcinna* Harvey.—This name had better be erased from the Alberta list, the series I had so referred being, as above stated, typical *agrestis*. The type of *inconcinna* in the British Museum is a male from

Texas, and is smaller, redder and less maculate than any I had previously seen. Hampson treats it as a good species, figuring a Texas specimen, but apparently not the type. He omits it from the tables, however, and records both this and *agrestis* from Texas and Mexico. Some material that I have from Texas and Arizona seems to indicate that the forms may connect, and an examination of those in other collections has not helped me in a separation. I should not feel justified, however, in making the reference at present.]

225. The species I had so listed is certainly not *terrealis*, though I have not yet found a name for it which satisfies me. It may be found to connect with *sordida* Smith, described from Kaslo, but its rarity both here and in British Columbia has prevented much study. A male type of *terrealis*, from a figure of which Hampson's figure was taken, is in the Brooklyn Museum. It has ciliate antennæ merely and is more correctly referable to *Rhizagrotis* Smith than to this group.

228. *Feltia hudsoni* Smith.—I do not appear to have met with this form here since writing my former notes, but have seen two females from Stockton, Utah, in Prof. Smith's collection, which agree with the types there. Under the circumstances, I have not had much further means of judging whether the form is really a good species, or, as I rather suspect, merely a variety of the following.

229. *F. ducens* Walk.—This is the common and widely distributed species standing wrongly in our lists as *subgothica* Haw., which is really prior to *tricolor* Lint. The correction was originally made by the late Prof. Slingerland in CAN. ENT., XXVIII, 295-299, who figured on Plate 4, at bottom, what he produced good evidence to show was Haworth's type, a male from "U. S. A." The upper figure on the same plate is of a female type of *tricolor* in Slingerland's possession. Other types of *tricolor*, both of which I have seen, are a male from Albany, N. Y., in the Strecker collection, and a female from New York in the British Museum, where is also the type of *subgothica*, obviously the same species. Sir George Hampson catalogues and figures this and *ducens* correctly, and Prof. Smith accepts the synonymy in Journ. N. Y. Ent. Soc., XV, 146 (Sept., 1907), pointing out Slingerland's error in CAN. ENT., XXVII, 301 (1895) but apparently overlooking his correction made in the following year, and referred to above. The type of *ducens* is a worn male in the British Museum labelled "W. Canada, Orilla (Bush)," which probably means Orillia, Ont.

231. *F. venerabilis* Walk.—I had this species correctly listed, and Holland's fig. 26, pl. XXII, is correct, Mr. E. J. Smith adjusting his own error in Ent. News, XVI, 277, Oct., 1905. The explanation of my having likened this species to Sir George Hampson's figure of *volubilis* rather than of *venerabilis*, is that the figure of the latter is, so my notes tell me, bad and misleading. When I wrote my notes I had never seen *volubilis*, the Chicago specimens received under that name having been all *venerabilis*. Walker's type of this is a badly worn male from Nova Scotia, and happens to be an unusual form rather *volubilis*-like in appearance. *Venerabilis* has male antennæ strongly bipectinate, and *volubilis* serrate-fasciculate only, and as a rule the two are entirely dissimilar in appearance. But specimens of one very closely resembling the other undoubtedly sometimes occur, and I have such in my series.

232. *F. vancouverensis* Grt.—I have come across no more specimens here of the form I thus listed, but have four similar specimens from Field, B. C., taken by the late Dr. James Fletcher, and one from Windermere. The latter is dated July 12th, 1907, and the Field specimens July 5th, 1902. They are smaller, paler, and less strongly marked than *vancouverensis* from the B. C. coast, but may be a small race of that species. The *volubilis-vancouverensis* group is a difficult one, comprising some forms which seem locally constant, and requires studying in longer series than I have yet been able to compare. The specimen figured by Holland as *vancouverensis* is certainly not that species. It is stated in the text to come from Labrador. I cannot name it with certainty, but it is much more like *opipara* Morrison or *munis* Grote.

233. *F. obliqua* Smith.—I have the species from Mr. Baird, of High River.

234. *Porosagrotis retusta* Walk. is the correct name for this species, Dr. Dyar's *catenula* of the Kootenai List is the same. *Catenula* Grt. is prior to *Euxoa contagionis* Smith. As a matter of fact, I believe Prof. Smith would include Calgary specimens under his name *catenuloides*, but I cannot see that this is even a well marked variation. (Cf. Journ. N. Y. Ent. Soc., XVIII, 88, and Ent. News, XXI, 396-7, June and Nov., 1910) I have it from High River.

[236. The worn specimen I had listed doubtfully as *orthogonia* is not that species, nor in the least like it. It is near, or possibly identical with, the following.]

237. *Euxoa rumatana* Smith, = *Agrotis dargo*, Strecker, the latter specific name having preference by five years. I have three male co-types of *rumatana* from Volga, S. D., one of which I have labelled as being exactly like a type of *dargo*, from Loveland, Colo., in the Strecker collection, which is a trifle paler only. I have also compared the male and female types of *rumatana* at Rutgers-College. I have Calgary and High River specimens of the same species. A male from Chicago is very similar, but darker in colour, with smaller orbicular, and less of dark border to secondaries.

238. This species is not *plagigera*, at least so far as I can at present discover, but has been described from Calgary as *Rhizagrotis perolivalis* by Smith (Journ. N. Y. Ent. Soc., XIII, 194). A male and female co-type are in my collection. Its nearest named ally appears to be *olivalis* Grt., from which it differs considerably in maculation, and structurally in having male antennæ ciliate instead of serrate-fasciculate.

239. *E. olivalis* Grt.—One of my Calgary specimens I have compared with the type, a female in the British Museum from Colorado. The *olivalis* of the Washington collection when I was there was *ridingsiana*. *Agema* Strecker, from Colorado, is in all probability a dark olivaceous specimen of *olivalis*, though I refrain from making the reference definitely at present. I am under the impression that nearly all the specimens I have seen in collections standing as *plagigera* have been *olivalis*. I do not know where Morrison's type is, nor whence it was described. *Oblongistigma* Smith, described from four females from Black Hills, Montana, is a browner, smoother form, but very much like *olivalis*, and not certainly distinct. Hampson figures Smith's species correctly from Colorado, though another Colorado specimen which I found associated with it in the collection was distinct. I have a long series from Stockton, Utah, which appear to grade through. I have seen four specimens labelled "types" of *oblongistigma*. Two females are in the Brooklyn Museum, and a male in the Henry Edwards collection in the American Museum of Natural History. Prof. Smith claims that the latter, though of the same species, cannot be of the type lot on account of its sex. A female at Washington from Nevada Co., Calif., bears the museum red "type" label, but, Prof. Smith tells me, erroneously so. That is fortunate, as it is a distinct species from those at Brooklyn, and nearer *quadridentata* G. & R. It may be what Prof. Smith has since described as *flutea* (Trans. Am. Ent. Soc., XXXVI, 255, Nov., 1910).

240. *E. maimes* Smith, = *ridingsiana* Gt.—This reference is on the strength of a comparison of a Calgary specimen with the male type of *ridingsiana* in the British Museum. Grote described his species in 1875 from the Sierra Nevada, California, though Sir George Hampson erroneously attributes it to Colorado, nor is California given in Prof. Smith's monograph or catalogue. *Maimes* was described in 1903 from five males and seven females from Calgary, Alta.; Brandon, Man.; and Colo. It is very apt to be confused with *Rhizagrotis flavicollis* Smith, which is the most closely resembling species I know. Structurally, of course, the male antennæ of *flavicollis* are ciliate only, and in *ridingsiana*, by which name *maimes* should in future be known, they are serrate-fasciculate. In maculation *flavicollis* may best be distinguished by the contrastingly pale collar and costa. In *ridingsiana* the collar is usually a little paler than the thorax, but is less contrasting, and the costal area is more streaky and less clear. It is usually common here, and apparently less so in Manitoba and Saskatchewan. Dr. Dyar has taken it at Field, B. C., and I have one in my collection from Colorado, and two from Stockton, Utah. Sir George Hampson, who has a number of Calgary specimens, bears me out in the above reference (in litt.).

241. *E. pugionis* Smith.—It seems extremely probable that this will turn out to be *quadridentata* Grote & Rob., though as I have not seen the type of the latter I dare not make the reference. The description and figures agree with *pugionis*, and Dr. Barnes thinks they are the same. I do not possess the description, and omitted to note the type locality, but believe it to be Colorado. Prof. Smith has a male type of *pugionis* from Colorado, and others, including Calgary specimens, in the series. These I noted had for the most part small, ovate, closed orbicular, and very dark secondaries. His series under *quadridentata* included a pair of "Xd types" from Stockton, Utah, and seemed to be characterized by a larger, slightly open orbicular, and slightly dark secondaries. They did not satisfy me as distinct, and I have specimens from Calgary, from Stockton, Utah, New Mexico and Colorado, which certainly seem all one species, and in which these characters are variable. As a matter of fact, *pugionis* as described, from seven males only from Colorado and Calgary, should, by description, have pure white secondaries in that sex. This is by no means always the case, even in one locality. The females differ in having collar and costal and inner margins grayish white instead of yellow, and usually darker secondaries. The *quadridentata* of the British Museum

did not seem to me distinct from *pugionis* of the same collection. Hampson separates them in the tables on the colour of secondaries. The *quadridentata* of the New York and Washington Museum collections are probably not that species. They were at any rate not *pugionis*. Holland's figure under *quadridentata* is typical *niveilinea*. *Flavidens* Smith, of which I have a female from Prescott, Ariz., compared with a female type from New Mexico at Washington, is a larger and altogether darker species, correctly figured by Holland, but apparently wrongly by Hampson, his *flavidens* seeming to me a suffused *pugionis*.

242. *E. cogitans* Smith (1890), = *choris* Harvey. (1876, Hamps. Cat., IV, 265).—Sir George Hampson's reference appears to me to be correct, and I have specimens compared with both types. Prof. Smith has called the synonymy in question (Journ. N. Y. Ent. Soc., XV, p. 143, Sept., 1907), stating that he had two closely allied species in his collection under the two names. Had such appeared to me the case I should certainly have taken a note upon it when going over his material, but have no record that his *choris* seemed different. I took a female here on Aug. 10th, 1905, the only one since the male previously listed. I have a long series from Stockton, Utah. *Achor* Strecker, described in 1899 from Colorado, appears to me to be a slightly aberrant *choris*, browner and less gray than usual. The type of *choris* is from Nevada. Of *cogitans*, there are a pair of types in the Brooklyn Museum, the male from Colorado, the female from California, and a pair of types from California at Washington.

243. The specimen I have recorded from here as *Euxoa perfusca* Grt. is not that species, but bears a close resemblance to Walker's type of *perlentans* from New York, in the British Museum, with which I have compared it. I cannot be sure that it is identical, but it resembles it more closely than anything that I have yet come across. I have never taken another specimen very like it. My specimen may very likely be a form of *tessellata*, to which *perlentans* seems correctly referred, so far as I could judge.

244. The species which I quite wrongly recorded as *punctigera* appears to be undescribed, though I prefer that it should remain so at present, as it may turn out to be *sordida* Smith, which is at any rate its nearest ally known to me, but of which I have little knowledge of the variation. The female (of No. 244) is of a rather uniform dull mahogany brown, with the discoidal spots usually rather conspicuously yellowish ringed, and has the abdomen of that depressed shape which probably caused Prof. Smith to place *boretha* and *sordida* in *Chorizagrotis* (Journ.

N. Y. Ent. Soc., XVI, 86, June, 1908). All the males I have seen have been considerably redder in shade, and often closely resemble some dark red forms of *ochrogaster*. Holland figures a female of the species as *titubatis*, which it does not very closely resemble. The *punctigera* of the Kootenai List was also wrongly named, the bulk of the material being the species since described by Smith as *cocklei* (Ann. N. Y. Acad. Sci., XVIII, 96, Jan., 1908), which I make, by direct comparison with both types, = *perfusca* Grt., though at my suggestion Prof. Smith has since made a comparison himself, and is unable to support me in the reference. The type of *perfusca* is a female from Arizona in the Brooklyn Museum. It has also seemed to me that the *perfusca* of most of the other collections I have seen, including the British Museum, have been wrongly named.

245a. *E. megastigma* Smith, = *acornis* Smith. The female type of *megastigma* in the Washington Museum is a dark ochreous-gray specimen, with large, pale, oblique orbicular. The space between the discoidal spots is not nearly as dark as indicated in Sir George Hampson's figure, which is copied from a figure of this type, and not, as I erroneously stated before, from the type direct. A female co-type in Prof. Smith's collection is the same species.

246. *E. scandens* Riley.—A male from the Red Deer River, north-east of Gleichen, on July 7th, 1905, is the only other Alberta specimen I have seen besides the one previously recorded. It appears to be more common in Saskatchewan and Manitoba. There are a male and female type in the Washington Museum. *Setagrotis elata* Smith appears to me the same species. It was described from two males and a female from Colorado, and a pair of types are at Washington, and a male co-type with Prof. Smith. I made very careful comparisons, and have a specimen which I compared with the types of both names, and my notes say that I considered them "unquestionably the same." Prof. Smith, at my suggestion, has compared them since, and is unable to agree with me in the reference. Sir George Hampson places both in the genus *Lycophotia* Hübner, of which he makes *Peridroma* Hübner and *Setagrotis* Smith synonyms. *Elata*, however, was known to him only by a figure.

247. *E. vulpina* Smith.—A male at light on Sept. 23rd, 1907, is only the fourth specimen I have seen to be sure of. I have not yet identified it with any other named species. It is an ally of *incallida*, and is one of a group in which species are extremely hard to distinguish, and enormously variable.

(To be continued.)

RARE CAPTURES OF LEPIDOPTERA.

Pholus pandorus Hbn.—On the evening of July 30, 1910, I noticed a specimen of this hawk-moth on the wire of an electric light on Centre Island breakwater, Toronto. Placing my coat at the base of the pole so that the insect would not get lost amongst the rocks, I tapped the wire and it floated down. It is a beautiful female specimen, and had evidently emerged quite recently, as it secreted fluid while being captured. (Paul Hahn.)

Euptoieta claudia Cram.—While playing tennis in a gale on the lawn of the Royal Canadian Yacht Club, Centre Island, Toronto, Sept. 10, 1910, I observed a butterfly that, at first, seemed to be an *Argynnis*, but observing the peculiarity of its flight, the game was stopped and the insect captured. It proved to be a male of the above species. (P. Hahn.)

Charidryas nycteis D. & H.—A curious aberrant specimen of this butterfly was taken near the Hunt Club grounds, east of Toronto, during August, 1910, by Mr. J. R. McMurrich. The dark markings are more extensive and confluent than usual, those on the basal half of the wings forming an almost solid dark area. The broad pale submedian band is somewhat reduced, and is white instead of brownish-yellow, though the small spots in the marginal band are of the usual colour. The under side is normal. The specimen is much worn.

Mr. McMurrich also reports the capture of a specimen of *Speyeria idalia* Dru. near Forest Hill Road, Toronto, about the end of August, 1911. (E. M. W.)

Work is now being carried on to arrange and equip an entomological building at Rutgers College, New Brunswick, N. J. The building will have two stories, will provide for classrooms and laboratory work on the first floor, and will furnish offices and space for collections on the second floor, as well as accommodations for the assistants in experiment station work.—*Science*.

We have much pleasure in announcing that Mr. J. Eaton Howitt, B. S. A., M. A., Secretary-Treasurer of the Entomological Society of Ontario, has been appointed Professor of Botany in the Ontario Agricultural College, Guelph. For the last five years Mr. Howitt has been a most efficient lecturer in the Botanical Department of the College, and has well earned the promotion which has now been accorded to him.

NEW SPECIES OF EMPRIA.

II.—WESTERN SPECIES.

BY ALEX. D. MACGILLIVRAY, ITHACA, N. Y.

(Continued from page 311.)

Empria capillata, n. sp.—Female. Clypeus with a median carina, broadly, shallowly emarginate, without a median tooth, lobes broadly rounded; antennal furrows interrupted; the ocellar basin a broad, rounded, rather shallow depression, extending to the median ocellus, and between the bases of the antennæ; the median fovea a broad flaring crater at the ventral end of the ocellar basin; the ocellar and interocellar furrows distinct; the third segment of the antennæ longer than the fourth; the saw-guides convex above and below, broadly rounded at apex above and below to a rounded point just above the middle at apex; body black, with the collar and outer half of the tegulæ white; the knees and the front and middle legs below the knees infuscated. Length, 6.5 mm.

Habitat.—Peck, Idaho. Professor J. M. Aldrich, collector.

Empria carbasea, n. sp.—Female. Clypeus flat, without a median carina, deeply angularly emarginate, lobes angular and rounded at apex; antennal furrows not interrupted; ocellar basin broad and flat, extending between the antennæ, reaching the median ocellus, the median fovea pit-like, minute, above the ventral end of the ocellar basin; ocellar and interocellar furrows distinct; the third segment of the antennæ slightly longer than the fourth; saw-guides convex, above and below, obliquely, roundly truncated to a round apex below the upper margin; body black, with the clypeus, labrum, genæ, a line on the inner orbits to the occiput, the collar, tegulæ, an elongate spot on the pleuræ, coxæ, trochanters, femora at base and beneath, the front tibiæ, the middle tibiæ except a ring at apex, the hind tarsi at base and beneath, the tarsi more or less at base, and a band on the abdominal pleuræ, white. Length, 8 mm.

Habitat.—Olympia, Washington. Professor Trevor Kincaid, collector.

Empria confirmata, n. sp.—Female. Clypeus with a median carina, emarginate with a blunt tooth, the lobes rounded; the antennal furrows interrupted; the ocellar basin a broad, linear, flat-bottomed depression, extending from the median ocellus almost to the dorsal margin of the antennal foveæ; the median fovea a broad indistinct depression on a shelf ventrad of the ocellar basin and completely separated from the ocellar

basin ; the ocellar and interocellar furrows distinct ; the third segment of the antennæ longer than the fourth ; the saw-guides convex above and below, broadly, convexly rounded at apex ; body black, with the collar, front legs below the knees, and the knees of the middle and hind legs, white. Length, 6.5 mm.

Habitat.—Olympia, Washington. Professor Trevor Kincaid, collector.

Empria concitata, n. sp.—Male. Clypeus flat, without a median carina, with a minute tooth, roundly emarginate with rounded lobes ; ocellar basin with broad, flaring sides, extending to the median ocellus, the median fovea a broad, flaring pit at the ventral end of the ocellar basin, as wide as the ocellar basin ; the antennal furrows not interrupted ; the ocellar and interocellar furrows distinct ; the third and fourth segments of the antennæ subequal ; body black, with a white line on the collar, the knees and the tibiæ of the front legs white, the tibiæ of the middle legs infuscated. Length, 6 mm.

Habitat.—Olympia, Washington. Professor Trevor Kincaid, collector.

This specimen was originally described as the male of *Monostegia kincaidii*, from which it is very different.

Empria condensa, n. sp.—Female. Clypeus with a median carina, narrowly, shallowly emarginate, with lobes rounded outwardly and angular inwardly, the median tooth as long as the lateral lobes ; the ocellar basin and the median fovea forming a dumb-bell-shaped depression, the median fovea a rounded pit in line with the dorsal margin of the antennal foveæ, the ocellar basin extending to the median ocellus ; the interocellar furrow distinct, the ocellar furrow linear ; the third segment of the antennæ distinctly longer than the fourth ; the saw-guides straight above and below, slightly converging toward the apex, apex broadly, somewhat truncately rounded ; body black, with the clypeus, labrum, collar, tegulæ, and legs for the most part below the coxæ, white. Length, 5 mm.

Habitat.—Polk County. Professor C. F. Baker, collector. No. 6498.

Empria condita, n. sp.—Female. Clypeus with a median carina, without a median tooth, broadly, shallowly emarginate, lobes angular ; the antennal furrows interrupted ; the ocellar basin a broad depression extending from the median ocellus to the middle of the antennal foveæ, the median fovea a broad, shallow depression near the middle of the ocellar basin ; the third segment of the antennæ longer than the fourth ;

the ocellar furrow deep, the interocellar furrow deep and Y-shaped; the saw-guides convex above and below, slightly, obliquely truncate at apex, with rounded angles; body black, with the collar, tegulæ, front and middle legs below the knees, and the base of the hind tibiæ, white. Length, 7 mm.

Habitat.—Colorado. Professor C. F. Baker, collector.

Empria contorta, n. sp.—Female. Clypeus with a median carina and without a median tooth, shallowly emarginate, lobes broadly rounded; antennal furrows interrupted; ocellar basin broad, oval, with sloping sides on its lower three-fourths, constricted just below the median ocellus, and expanding slightly at the ocellus; the median fovea broad and deep, located near the middle of the lower portion of the ocellar basin; the third segment of the antennæ longer than the fourth; the ocellar and interocellar furrows deep, the interocellar furrow somewhat Y-shaped; the saw-guides strongly concave above, slightly convex below, broadly rounded at apex, with a broadly rounded knob at apex above; body black, with the collar, tegulæ and legs below the knees white. Length, 7 mm.

Habitat.—Chimney Gulch, Colorado. Mr. E. J. Osler, collector.

Empria culpata, n. sp.—Female. Clypeus with a median carina, shallowly, roundly emarginate, without a tooth, lobes rounded; ocellar basin extending from the median ocellus to the dorsal margin of the antennal foveæ, a linear depression, broadest below; the median fovea shallow, quadrangular, separated from the ocellar basin; ocellar and interocellar furrows distinct; the third segment of the antennæ longer than the fourth; the saw-guides straight above, convex below, obliquely rounded at apex, densely hairy; body black, the collar white, the legs below the knees more or less rufous infuscated. Length, 6 mm.

Habitat.—Olympia, Washington. Professor Trevor Kincaid, collector.

Empria cumulata, n. sp.—Clypeus with a median carina, roundly emarginate without a tooth, lobes rounded; the ocellar basin a narrow linear depression extending from below the dorsal margin of the antennal foveæ to the median ocellus, somewhat interrupted at middle, the median fovea deep, elongate; the ocellar and interocellar furrows indicated; the postocellar area polished; the third segment of the antennæ slightly longer than the fourth; the saw-guides straight above, convex below, obliquely truncated at apex; body black, with the collar white, the front and middle legs reddish infuscated below the knees. Length, 6 mm.

Habitat.—Olympia, Washington. Professor Trevor Kincaid, collector.

Empria conferta, n. sp.—Female. Clypeus with a median carina, emarginate without a tooth, lobes rounded; ocellar basin a broad, deep depression extending to the median ocellus, extending between the antennæ and not limited by a transverse carina; the median fovea a rounded pit near the middle of the ocellar basin and connected by a linear furrow with the median ocellus; antennal furrows interrupted; ocellar furrow indicated at middle, the interocellar furrow distinct; the third segment of the antennæ longer than the fourth; the saw-guides convex above, and below, convexly, obliquely truncated to a point above at apex; body black with the collar, tegulæ, knees, and front and middle tibiæ white. Length, 7 mm.

Habitat.—Colorado. Professor C. F. Baker, collector.

Empria concreta, n. sp.—Female. Clypeus with a median carina, roundly emarginate with a broad, rounded tooth, lobes broadly rounded; ocellar basin broad and shallow, reaching the median ocellus, extending nearly to the ventral margin of the antennal foveæ, a deeper linear depression between the median fovea and the median ocellus, the median fovea a rounded pit situated above a line drawn through the dorsal margin of the antennal foveæ; the antennal furrows interrupted; the ocellar and interocellar furrows distinct; the third segment of the antennæ longer than the fourth; the saw-guides straight above, slightly concave below, broadly and somewhat obliquely rounded at apex; body black with the collar, tegulæ, knees, front and middle tibiæ and tarsi, tarsi somewhat infuscated, white. Length, 8 mm.

Habitat.—Colorado. Professor C. F. Baker, collector.

Empria conciliata, n. sp.—Female. Clypeus with a median carina, angularly emarginate, the median tooth small and pointed, lateral lobes angularly rounded; antennal furrows not interrupted; the ocellar basin extending from the median ocellus to the middle of the antennal foveæ, broad with sloping sides, abruptly elevated at its ventral end, with a flat, polished shelf at ventral end, a broad crater-like pit in front of the shelf, the median fovea; ocellar and interocellar furrows distinct; the third segment of the antennæ slightly longer than the fourth; the saw-guides straight above and below, squarely, truncately rounded at apex, margin fringed with hairs; body black with the labrum, collar, tegulæ, and legs below the knees white. Length, 7 mm.

Habitat.—Chimney Gulch, Colorado. Mr. E. J. Oslar, collector.

Empria contexta, n. sp.—Female. • Clypeus with a median carina and a broad median tooth, the lobes broadly rounded; the antennal furrows interrupted; the ocellar basin flat, not reaching the median ocellus, the median fovea a small, pin-hole puncture; the ocellar and interocellar furrows distinct; the third segment of the antennæ longer than the fourth; the saw-guides straight above, convex below, squarely, slightly obliquely, truncated at apex with the lower angles rounded; the body black with the clypeus, labrum, collar, and tegulæ white; the front and middle legs more or less yellowish infuscated. Length, 6mm.

Habitat.—Colorado. Professor C. F. Baker, collector.

Empria kincaidii MacG.—Female. Clypeus with a median carina, emarginate with a median tooth, lobes rounded; antennal furrows interrupted; ocellar basin extending to the median ocellus, ending ventrally at the dorsal margin of the antennal foveæ, broad and flat with a median carina; the median fovea wanting or very indistinct; the saw-guides convex above and below, slightly obliquely, convexly rounded at apex.

This species was originally described as *Monostegia kincaidii* from one male and seven female specimens. A re-examination of this material has shown it to be a composite of several species.

Empria curata, n. sp.—Female. Clypeus with a median carina, deeply, angularly emarginate, with a distinct tooth, the lobes angular; the ocellar basin diamond-shaped on its lower half, constricted above by a pair of rounded, mound-shaped elevations situated below the median ocellus; the median fovea a broad pit, situated above the dorsal margin of the antennal foveæ; the antennal furrows interrupted; the ocellar and interocellar furrows distinct; the antennæ with the third segment longer than the fourth; the saw-guides straight above and below, obliquely rounded at apex; body black with the collar white, the front legs below the knees more or less rufous. Length, 7 mm.

Habitat.—Olympia, Washington. Professor Trevor Kincaid, collector.

Empria cuneata, n. sp.—Female. Clypeus with a median carina, deeply, angularly emarginate with a median tooth, the lobes angular; the ocellar basin linear, slightly wider below, the median fovea deep; the ocellar furrow distinct, the interocellar furrow continued below the median ocellus to the middle of the ocellar basin; the third segment of the antennæ longer than the fourth; the saw-guides straight above, straight and oblique below, slightly, obliquely rounded at apex; the body black,

with the collar white, the front and middle legs below the knees rufous infuscated. Length, 6.5 mm.

Habitat.—Olympia, Washington. Professor Trevor Kincaid, collector.

Empria concisa, n. sp.—Female. Clypeus with a median carina, roundly emarginate without a tooth, lobes rounded; the antennal furrows not interrupted; the ocellar basin broad, with sloping sides, reaching the median ocellus, extending to the middle of the antennal foveæ, the median fovea a small pit on a level the dorsal margin of the antennal foveæ; the ocellar and interocellar furrows distinct; the third segment of the antennæ longer than the fourth; the saw-guides convex above and below, obliquely rounded at apex above and below to a point slightly above the middle of the apex; body black, with the labrum, collar, tegulæ, knees, front and middle tibiæ and tarsi, all more or less infuscated, white. Length, 7 mm.

Habitat.—Pullman, Washington. Professor C. V. Piper, collector. No. 13.

Empria cupida, n. sp.—Female. Clypeus with a median carina, shallowly emarginate with a tooth, lobes acute; the ocellar basin a broad, shallow depression, broadest near the middle, extending to the median ocellus; median fovea broad and deep, situated above the dorsal margin of the antennal foveæ; ocellar and interocellar furrows distinct; the third segment of the antennæ longer than the fourth; the antennal furrows interrupted; the saw-guides straight above, convex below, obliquely, convexly rounded to a point above at apex; body black, with the collar and front and middle legs below the knees white. Length, 6 mm.

Habitat.—Olympia, Washington. Professor Trevor Kincaid, collector.

MISCELLANEOUS NOTES ON THE HYMENOPTERA CHALCIDOIDEA: THE GENUS *ARTHROLYTUS* THOMSON;
HORISMENUS MICROGASTER ASHMEAD.

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Introduction.

In describing a new species of *Arthrolytus* Thomson, I merely bring together the literature of the group.

History and Description.

The genus *Arthrolytus* was founded by C. G. Thomson in 1878 with the rank of a subgenus *Pteromalus* Swederus, 1795. The description of *Pteromalus* and the *Conspectus subgenerum*, which includes *Arthrolytus*, were given by Thomson as follows:

October, 1911

"Genus PTEROMALUS Swederus.

"Caput mandibulis 4-dentatis, sinistra rarissime 3-dentata, genis sæpe compressis, vertice interdum medio acuto; clypeo apice medio plerumque emarginato; oculis interdum hirtis, peristomio sæpe parvo. Antennæ sæpius infra medium faciei convexæ vel interdum protuberantis insertæ, scapo haud brevi, annellis plerumque bene distinctis, clava haud stylata. Thorax haud elongatus, pronoti collari sæpius discreto, sed margine antico haud acute reflexo; metathorace plerumque punctulato, plica sæpius integra, interdum abbreviata sed semper distincta instructo, spiraculis raro magnis, nucha plerumque brevi, calli fimbria sæpe magna. Alæ radio quam metacarpo interdum brevior vel æquali, stigmate haud crasso, plerumque. ♂ semper immaculatæ; abdomen sæpe ♀ rotundum, ♂ ventre rarius plica instructo, fasciis nullis determinatus ornatum, segmento 8o ♀ plerumque brevi, 2o haud dense pubescente apice late rotundato. Pedes haud graciles, coxis posticis breviter ovatis, basi postice haud pubescenti." (Thomson, 1878, p. 145.)

The *Conspectus subgenerum* follows on the next page, after a paragraph of remarks; only those portions necessary for our purpose are given in full.

"CONSPECTUS SUBGENERUM.

A) Oculi hirti. Antennæ incrassatæ. Vertex medio acuto.

a) *Halizous*.

aa) *Trichoglenus*.

B) Oculi glabri.

b) Antennæ postannello parvo *Meraporus*.

bb) Antennæ postannello magno.

c) Metathorax nucha magna subglobosa. Antennæ flagello filiformi.

Abdomen ♀ ovato-acutum. Alæ metacarpo quam radio longior.

d) *Catolaccus*.

dd) *Pteromalus*.

cc) Metathorax nucha sæpius minima. Alæ metacarpo quam radio interdum brevior, rarissime longior. Abdomen ♀^a plerumque rotundum. Antennæ infra medium faciei convexæ vel valde prominulæ insertæ.

- e) *Diglochis*.
 ee) Metacarpus radio brevior vel æqualis.
 f) Abdomen oblongum.
 g) Vertex medio teres. Abdomen ♀ ovatum, subtus convexum. Alæ
 ♀ sæpe macula magna disci fumata. Antennæ ♀ clava parva
 pedicello brevior..... *Arthrolytus*.
 gg) Vertex medioacuto..... *Dibrachys*.
 ff) Abdomen rotundum. Genæ compresso-acutæ. Ala vitreæ, metacarpo
 radio brevior..... *Coelopisthus*."

(Thomson, 1878, pp. 146-147.)

The description of the genus is given later, on page 158, in the following words:

"Subgenus ARTHROLYTUS.

Caput vertice medio haud acuto, oculis sat magnis, ovatis, convexis glabris, clypeo apice truncto, mandibulis minus validus. Collare haud discretum. Alæ metacarpo radio vix longiore, disco ♀ sæpe macula magna fumata. Abdomen ovatum subtus convexum. Antennæ clava ♀ parva. Pedes crassi.

Detta subgenus afviker från *Diglochis* genom kortare metacarpus och annelli, mer eller mindre incrasserade antenner, äggformig abdomen hos ♀ och oftast afrindadt pronotum.^a

A) Antennæ minus validæ sec flægello incrassato, ♂ articulibus longis hirtis, infra medium faciei convexæ insertæ.

1. *A. punctatus* m :

B^b Antennæ flagello valido longe infra medium faciei protuberantis insertæ. Abdomen segmento ultimo spiraculis ab apice longe remotis.

2. *A. albiscapus* m :

C^c Antennæ flagello haud valido sed incrassato. Alæ immaculatæ.

a. This subgenus differs from *Diglochis* through the shorter (*kortare*) post-marginal vein and ring-joints (*anneli*), the more or less incrassate antennæ, egg-shaped abdomen in the female and the usually (most often, *oftast*) rounded (*afrindadt*) pronotum.

b. Page 159.

c. Page 160.

3. *A. rugifrons* m:

 ”
 (Thomson, 1878, pp. 158-160.)

Eight years later, Howard (1886), in a paper entitled "A Generic Synopsis of the Hymenopterous Family Chalcididae," repeated almost entire, with the exception of two or three sentences of minor importance, the *Conspectus subgenerum* of Thomson given in foregoing, and indicated that the then subgenus was as yet unknown in the continent of North America, north of Mexico. Howard, however, raised the tribes of Thomson to the rank of subfamilies, and his subtribes to the rank of tribes. In the following year, Cresson (1887) gave Howard's synopsis of the genus *Pteromalus* verbatim, so up to that epoch *Arthrolytus* was still retained as a subgenus.

In describing the first North American species Ashmead (1893) treated the group as a genus, and thus in 1893 it first attained to that rank, already foreshadowed by its treatment as such by Möller (1882) eleven years previously and the attitude taken by Howard in regard to the larger groups of Thomson. De Dalla Torre (1898) listed the species of the genus, and gave *Pteromalus* Thomson (*sic*) as its synonym, whereas in reality *Arthrolytus* being a part of *Pteromalus* Swederus has no synonym strictly, since it was taken out of the latter group and made independent of it. Its synonymy, therefore, should have been given as *Pteromalus* Swederus (*partim*). *Pteromalus* Thomson was a subgenus of *Pteromalus* Swederus; at present, the latter, therefore, should be *Pteromalus* Swederus (Thomson); Thomson practically gave us the modern conception of the genus *Pteromalus*. Then Ashmead (1904) in his monumental work on the Chalcidoidea formally defined the genus *Arthrolytus* in a synopsis of the modern tribe Pteromalini Ashmead, 1904, which is practically the old genus *Pteromalus* Swederus raised to the rank of a tribe. Also, Ashmead there, and previously in 1893, formally designated *Arthrolytus punctatus* Thomson as type of the genus, formerly such by page precedence. Finally, Schmiedeknecht (1907, 1909) treated the genus in a manner essentially similar to Ashmead's treatment, so that it is unnecessary to quote here.

The following description of the genus is based on Thomson's descriptions of the genus and species, that of Ashmead's and Möller's

species, the new species herein described, and the synoptic table given by Ashmead (1904, pp. 318-322).

Normal position.

Male, female: Normal for the subfamily and tribe. Head wider than thorax (dorsal aspect) with the vertex not acute medially, the occipital foraminal depression immargined, rounded; the eyes moderately large, ovate in the lateral aspect, convex, hairless, or practically so; the ocelli in a curved line on the vertex; apex of the clypeus emarginate or truncate at the meson; mandibles not strong, both 4-dentate, the outer or lateral tooth forcipiform, but variable in size; the antennæ inserted slightly below (ventrad) of the middle of the face (direct cephalic aspect), but above (dorsad of) an imaginary line drawn between the ventral ends of the eyes, the face produced below, the club in the female variable, not large, frequently smaller than the first funicle joint, the latter large, longer than the pedicel; in the male, joints 1-4 of the funicle all longer than wide; flagellum filiform or moderately clavate; scape reaching to the cephalic ocellus, or nearly.

Pronotum distinct, transverse, sometimes narrowed mesially and dilated laterad; mesothorax large, the parapsidal furrows incomplete, present cephalad and extending for not much more than half their length; axillæ widely separated; metathorax variable in length and declivous or not, with a small neck, tricarinate, punctate. Abdomen conic-ovate, convex ventrad, the ovipositor not exerted. Wings hyaline, or sometimes in the female with a large fumated spot in the disk, with the postmarginal vein equal to, or very slightly longer than, the stigmal vein.

Body metallic dark greenish, with brassy tinges, or shining blackish, sculptured, usually punctate. The males differ from the females in the following details: The flagellum of the antennæ is larger and filiform, the body slenderer, the abdomen somewhat shorter, about the length of the thorax and ovate and depressed, and the eyes slightly more rounded; the funicle joints are relatively larger and more hispid, the scape longer, the pedicel and second ring-joint shorter. The abdomen more often with a pallid spot at base, dorsad, or with some yellowish there.

Readily separated from *Pteromalus* Swederus by means of the short postmarginal vein and small metathoracic neck; from *Dibrachys* Foerster by the insertion of the antennæ near the middle of the face, that is, not much below (ventrad) the point midway between the cephalic margin of the vertex and the apical margin of the clypeus, the face being produced

below, and by the broader vertex at meson ; from *Metopachia* Westwood by the usually shorter postmarginal vein, the smaller metathoracic spiracles, and from the fact that in *Arthrolytus* the abdomen is not strongly keeled, or acutely, strongly produced or convexed ventrad near the base. Distinct, or not easily confused, with other genera of the Pteromalini, excepting, perhaps, *Coelopisthia* Foerster,^a from which it is easily distinguished by cephalic characters, antennal characters, and those of the abdomen.

Host Relations of the Genus.

Of Thomson's three species, which were probably captured at large, nothing concerning the host is known. *Arthrolytus puncticollis* Möller was described from specimens reared from the larva of (*Anobium*) *Sitodrepa panicea* (Linnaeus), a coleopteron of the family Ptinidæ. Ashmead's species, *apatela*, is recorded from a lepidopteron, *Apatela populi* Riley, of the family Noctuidæ, but its relationships here are doubtful, *Rhogas intermedius* Cresson also being present ; while *æneoviridis* Girault has doubtful relationships, having been reared from breeding-cages containing the larvæ of (*Alceris*) *Peronea minuta* (Robinson), of the lepidopterous family Tortricidæ, the adults emerging after the ichneumonoid *Clinocentrus americana* Weed, and before *Horismenus microgaster* (Ashmead). It is therefore probably a secondary parasite of the *Peronea*, its host being the *Clinocentrus* ; I think it more probably a primary parasite of the lepidopteron, however. From these few records, of course, it would be hazardous to generalize in regard to the genus as a whole. It is indicated that the genus may attack the Hymenoptera, and thus play a secondary or even tertiary role of parasitism for the Lepidoptera and Coleoptera, somewhat like the role of *Dibrachys*.

Distribution of the Genus.

The genus is represented in the continents of Europe and North America. Of the European species, of which there are four, all are confined, so far as is yet known, to the Scandinavian Peninsular (de Dalla Torre, 1898), Sweden. The two North American species are recorded from Ohio (*apatela* Ashmead), and Iowa (*æneoviridis* Girault.)

a. No species was mentioned in connection with the genus by Foerster, but as Thomson adopted the name and designated a type for the genus, the name holds, and Foerster is held responsible for it.

Family Pteromalidæ.

Subfamily Pteromalinæ.

Tribe Pteromalini.

Genus *Arthrolytus*(Type *Arthrolytus punctatus* Thomson).*Pteromalus* Swederus (*partim*).Thomson, 1878, pd. 147, 158.—Subgenus *Arthrolytus*.Howard, 1886, pp. 38, 97.—Subgenus *Arthrolytus*.Cresson, 1887, pp. 77, 138.—Subgenus *Arthrolytus*.Ashmead, 1893, p. 162.—Genus *Arthrolytus*.De Dalla Torre, 1898, p. 153 —Genus *Arthrolytus*.Ashmead, 1904, pp. 320, 322, 367.—Genus *Arthrolytus*.Schmiedeknecht, 1907, p. 479.—Genus *Arthrolytus*.Idem, 1909, pp. 329, 331, 358-359.—Genus *Arthrolytus*.*Descriptions of the Species.*1. *Arthrolytus punctatus* Thomson.

Thomson, 1878, pp. 158-159.

Ashmead, 1894, p. 339.

De Dalla Torre, 1898, p. 155.

Ashmead, 1904, pp. 320, 367.

Schmiedeknecht, 1909, p. 359.

"1. *A. punctatus* m: Obscure æneus, antennis basi pedibusque rufescentibus, alis ♀ macula magna disci fumata. Long., 3-4 mill.

"*Pteromalus maculipennis* Walk., l. c. III, 191, 83 (forte).

"Caput thorace fere latius, subtransversum, antrorsum vix angustatum, pone oculos magnos ovatos subangustatum, vertice minus lato, ocellis parvulis in lineam curvam dispositis; facie convexa, fortiter concinne punctata, scrobe antennali parum impressa; clypeo vix discreto, sinu laterali parvo, apice medio truncato, genis parum buccatis haud compressis; mandibulis 4-dentatis, dente apicali parum forcipato. Antennæ infra medium, faciei insertæ; articulo 10 testaceo, ocellum haud attingente, 20 longo sed postannello brevior, annellis haud parvis sed flagello arcte adpressis, 5-10 sensim brevioribus et paullo crassioribus 50 basin versus attenuato longo quam 100 transverso multo longiore, clava parva postannello brevior, apice oblique acuminata. Thorax sat crassus, supra convexus, obscure olivaceo-æneus, fortiter concinne punctatus, subglaber; pronoto haud plane verticali, collari^a haud discreto; meta-

a. Beginning p. 159.

thorace sat longo concinne punctato, nucha tantum linea apicali elevata indicato, carina media elevata, plica sat distincta vix arcuata, interdum costula transversa instructo. Alæ fere vitreæ, parum pubescentes, haud longæ nec latæ, cellula basali et speculo magno nudis, stigmate tenui metacarpo sesqui longiore, radio sub angulo sat acuto egrediente, clava parva quam metacarpo vix brevior, disco macula magna fumata ad radii clavam usque extensa et ad marginem inferum fere descendente. Abdomen cupreo-aureum, splendens, segmentis 20 viridi, subtus interdum pallido et 30 40 que fere glabris, 3-6 sensim brevioribus, 80 parvo suberecto; ventre convexo sed haud compresso. Pedes validi rufescentes, coxis anterioribus interdum concoloribus. Mesosterni epimera punctata discreta, præsterna haud parva.

"Mas differt: antennis corporis fere longitudine articulis 20 brevior, 5-11 linearibus nigris longe hirtis, clava 2-articulata elongato-acuminata; metathorace longiore costula transversa magis distincta, abdomine oblongo macula pallida, femoribus basi et coxis totis viridiæneis.

"Sällsynt men troligen utbredd fran Skane till Lappland."^a

(Thomson, 1878, pp. 158-159).

As Thomson, in the description of the species just given, makes *Pteromalus maculipennis* Walker a possible synonym, the original description of that species is appended to the foregoing, for the sake of convenience. It is impossible to decide this from the descriptions. *A. punctatus* was designated by Ashmead in 1894 as the type of the genus, and again as such, by the same author, in 1904. Further than in the places already cited, the species has not been mentioned again in the literature. The original description of *Pteromalus maculipennis* Walker follows:

"*Pteromalus maculipennis* Walker.

"Corpus mediocre; caput thorace paullo latius: antennæ clavatæ, crassæ, corporis dimidio longiores; articuli 50 ad 10 mm. longitudine decrescentes latitudine increscentes; clava articulo 100, paullo latior vix duplo longior; thorax ovatus; prothorax brevis: mesothoracis parapsidum suturæ vix conspicuæ: metathorax brevis: abdomen ovatum, subtus angulatum, apice elevatum acuminatum, non compressum, thorace paullo longius et latius: segmentum 1 mm. magnum: sequentia breviora; oviductus occultus; alæ mediocres: nervus cubitalis radiali vix brevior.

a. Rarely, but probably scattered (*utbredd*) from Servia to Lapland.

Sp. Pter. maculipennis. Fem. *Viridis, abdomen cupreum, antennæ nigrae, pedes flavi, femora fusca, proalæ fusco maculatæ.*

"Viridis, parum nitens: oculi ocellique rufi: antennæ nigrae; articulus 1^{us}. flavus; 2^{us}. 3^{us}. et 4^{us}. fusi: abdomen cupreum; segmentum 1^{um}. laete cupreo-æneum; oviductus rufus; pedes flavi: coxæ virides; femora fusca; meso- et metatarsi pallide flavi, apice fusi: alæ sublimpidæ; prealæ sub nervis ulnari et cubitali fuscomaculatæ; squamulæ fuscæ; nervi fulvi; stigma minutum. (Corp. long. lin. 1-1 $\frac{1}{4}$; alar lin. 1 $\frac{1}{4}$ -1 $\frac{1}{2}$.)

"Var. B.—Abdomen purpureo-cupreum; segmentum 1^{um}. laete cupreoviride: femora flava

"Var. c. Var. b. similis: caput et thorax viridi-ænea.

"July, August: grass in fields; near London."

De Dalla Torre, 1898, p. 134.

2. *Arthrolytus albiscapus* Thomson.

Thomson, 1878, pp. 159-160.

Möller, 1882, p. 180.

De Dalla Torre, 1898, p. 155.

Schmiedeknecht, 1909, p. 359.

"2. *A. albiscapus* m: Viridis pedibus flavis, coxis posticis supra cyaneis tibiis antennisque scape albidis, abdomine aureo, alis macula magna disci fusca. ♀ Long., 3-4 mill.

"Præcedenti statura similis, sed facie infra medium valde protuberante, antennis scapo longiore, albo, flagello validiore sed haud incrassato, thorace laetius viridi subillissime punctato, collari multo augustiore, metathorace brevior et magis declivi, costula nulla, alis limpidis, radio subangulo^a acutior egrediente, stigmatibus crassioribus, pedibus præsertim femoribus adhuc validioribus, mandibulis externe sinuatis, apice forcipatis bene distinctus.

"Sällsynt i medlersta och södra Sverige."^b

(Thomson, 178, pp. 159-160.)

This species is mentioned by Möller (1882) in his description of *puncticollis*. With this exception, it is not again mentioned in the literature excepting in the citations given.

a. Beginning p. 160.

b. R. rely, in middle and southern Sweden.

THE COLOUR OF THE LIGHT EMITTED BY LAMPYRIDÆ.

BY W. W. COBLENTZ, WASHINGTON, D. C.

The light emitted by various animals has been described as being "blue," "bluish," "green," "yellowish," "orange-coloured," "red," etc. In view of the doubts* as to whether this colour is a subjective phenomenon, resulting from the variation in colour sensibility of the eye with variation in intensity, or whether it is an objective reality, it seemed of interest to attempt to settle the question by subjecting the light to physical analysis by means of instruments which are unbiassed in the matter. One can, of course, examine the light visually by means of a spectroscope and note that in some cases it is "bluer," and on other cases it "extends further toward the red," etc., but to those familiar with the vagaries of the human eye, such a record is useless. The proper instrument to use is a bolometer, but because of the lack of sensitiveness of such an instrument and because of the intermittence of the light, the spectral analysis of the light by such means is prohibited. Spectrophotometric comparisons are also precluded. The only satisfactory means available is the photographic plate, which is integrative in its action, and hence well adapted to study weak sources of radiation. The photographic plate must be of a special kind, sensitive to all parts of the visible spectrum. The nearest approach to this condition is the Wratten and Wainwright "Panchromatic" plate, which is sensitive, in a variable degree, to all frequencies from the ultra-violet far into the red. The method is really a species of spectro-photographic photometry, in which the light of the fire-fly and that of a standard source are photographed, after which the "densities" of the negatives are compared, in a manner to be described presently.

The apparatus used consisted of a large prism spectrograph of one meter focal length, giving a long spectrum, and a small spectrograph, of triple achromatic lenses, 6 cm. diameter and 18 cm. focal length, which had a much greater light-gathering power, hence useful in photographing the weak radiations in the red. The method of procedure consisted in holding the insects in the fingers, one or two at a time, over the spectrometer slit. This required an exposure varying from one to five hours on the large spectrograph, and from one to sixty minutes on the small

*Knab.—CANADIAN ENTOMOLOGIST, 37, p. 238, 1905

Molisch.—Leuchtende Pflanzen, Jena, 1904.

October, 1911

spectrograph to obtain satisfactory negatives of the various species of fire-flies. The photographing was done in a dark room. Over 150 negatives were taken, over 56 hours being spent in holding the insects in place. The plates, being sensitive to red light, were developed and fixed in a perfectly dark room. The numerous details in the work will be published in the complete paper.

Prints from negatives of the light of *Photuris pennsylvanica* and of *Photinus pyralis* are given in fig. 23, from which it is evident that the light of the *Photinus pyralis* does not extend so far into the blue ($\lambda = .5015\mu$)

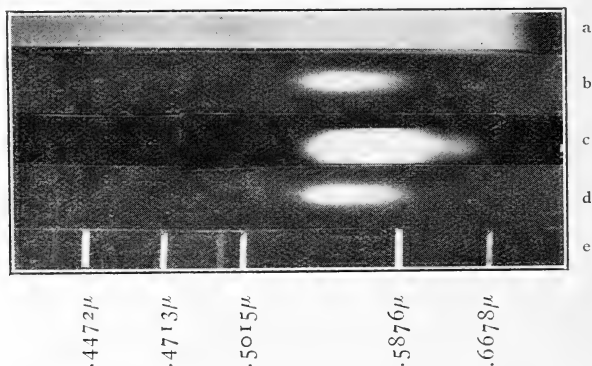


FIG. 23.—a, spectrum of "4 Watt" carbon glow lamp; b and d, spectrum of fire-fly, *Photinus pyralis*; c, spectrum of fire-fly, *Photuris pennsylvanica*; d, helium vacuum tube spectrum, used for comparison.

as, and that it extends farther toward the red ($\lambda = .6678\mu$) than does the light of the *Photuris pennsylvanica*.

In addition to the negatives of the fire-fly light, a series of photographs (see fig. 23), were obtained of the spectrum of a standard comparison lamp (carbon glow lamp operated on four watts per candle) when exposed for 2, 4, 6, 8, 12, 20, 30, 60, 120 and 240 seconds.

The "densities" or "blackening" of the photographic plates were then measured by means of a Marten's polarization photometer, mounted on a small comparator, in such a manner that strips 1.5 high and 1 mm. long were compared against the clear unexposed plate. These "densities," i.e., the amount of light absorbed, were then plotted to scale, as indicated in

fig. 24, where the horizontal scale is the wave length. In this illustration

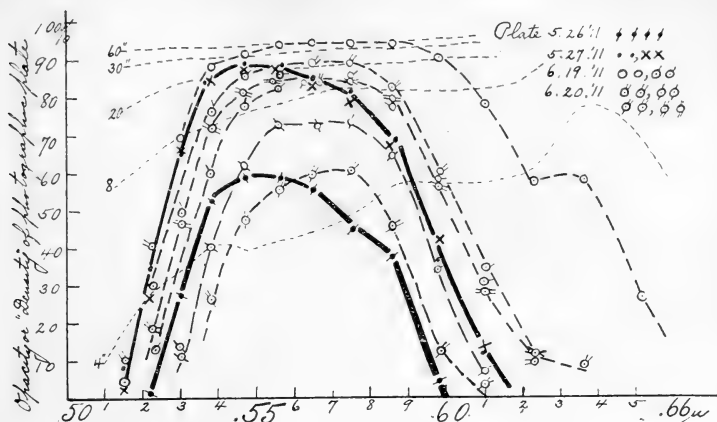


FIG. 24.—Density curves of photographic plates of *Photuris pennsylvanica* X——X——X

Photinus pyralis ϕ —— ϕ —— ϕ

Glow Lamp ————

the heavy black lines give the effect of the light of *Photuris pennsylvanica* (X——X——X, ϕ —— ϕ —— ϕ), of *Photinus pyralis* (θ —— θ —— θ), and of the carbon glow lamp (———).

This illustration, in itself, is an ample demonstration that the light of the *Photinus pyralis* is much richer in red and yellow rays than is the *Photuris*; for the curves intersect, and all those of the *Photinus*, whatever the density, lie to the right of those of the *Photuris* of equal density. But we can go a step farther by comparing densities of the negatives. It is assumed that the density or the effect of the light upon the photographic plate is proportional to the time of exposure. This is, of course, not true for very long exposures, and hence the highest parts of the curves are not used in this work. For convenience I have taken the four seconds glow lamp density curve as my unit. Hence the 8 seconds density curve represents 2 units, the 12 seconds density curve represents 3 units, etc. Turning now to the fire-fly curves we see that the upper, heavy, density curve of *Photuris pennsylvanica* intersects the 4 seconds density curve of the glow lamp at $.52\mu$ and at $.592\mu$; i.e., at these two points, the two

curves have the same density, which in magnitude, by our arbitrary scale, is 1 unit. At $.532\mu$ and at $.572\mu$ this same *Photuris* curve intersects the 8 seconds density curve of the glow lamp, and hence, on our arbitrary scale, photometric value at these two points is 2 units. At the intersections with the 20 seconds density curve of the glow lamp the photometric value is 5 units, etc. These photometric values, 1, 2, 5, etc., or ratios of densities, are plotted to scale in fig. 25. The dotted curve in this illustration is plotted from Langley's photometric values of *Pyrophorus noctilucus*.

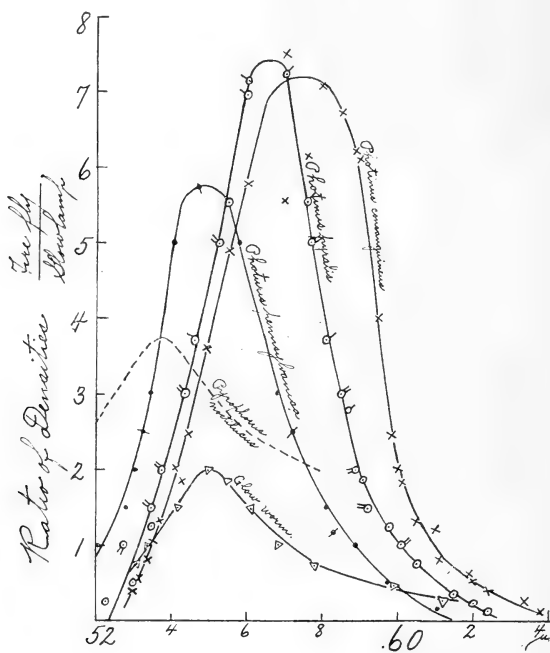


FIG. 25.—Ratio of densities of photographic plates :
 $\frac{\text{fire-fly light}}{\text{glow lamp light}}$

The fire-fly curves have now been compared against a standard source and their maxima are entirely different. It is of interest to note that the glow worm (larva of the *Photuris pennsylvanica*) has its maximum at practically the same place as has the adult insect. In these curves the various circles (o, ó, ö), etc., indicate that the resultant curve is the composite of numerous "density" curves. (See fig. 23.) The photographic

plate is very sensitive in the region of $.59\mu$, and it is difficult to eliminate this effect in the fire-fly curves. The hump in the curve of the light from the glow worm and of *Photinus consanguineus* at $.59\mu$ is, therefore, not considered of real significance. The curves of these two samples were obtained from the photographs taken with the small spectrograph.

Knowing the distribution of energy in the spectrum of the glow lamp, given in fig. 26, it is possible to determine the spectral energy distribution

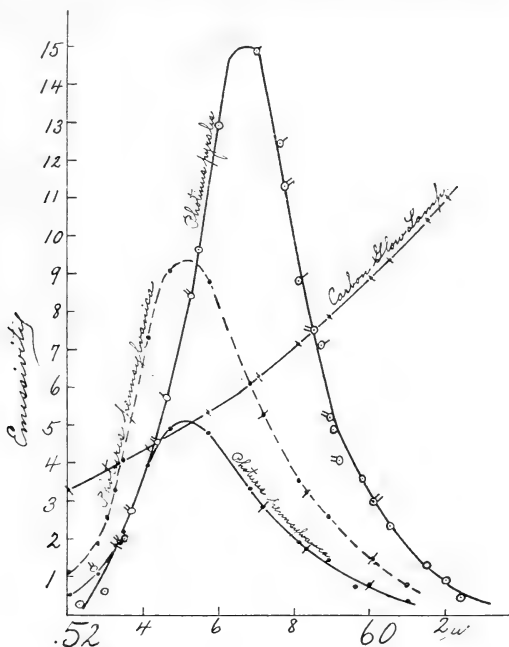


FIG. 26.—Spectral energy curves of fire-flies and glow lamp.

of the fire-fly by multiplying the energy values of the glow lamp by the ratio of densities, $\frac{\text{fire-fly light}}{\text{glow lamp light}}$, at each wave length. The resultant curves are given in figs. 26 and 27. In fig. 26 the spectral energy curve of the *Photuris pennsylvanica* and of the *Photinus pyralis* are plotted to the same scale in the blue-green. An integration of these two curves shows that for the same emissivity in the blue the energy curve of the *Photinus pyralis* is 2.83 times that of the *pennsylvanica*. To the eye it is apparent that the illuminating power of the *Photinus* is far greater than that of the *Photuris*.

The results of the study of the candle-power, radiation and temperature measurements will be described at some future time, and it will be

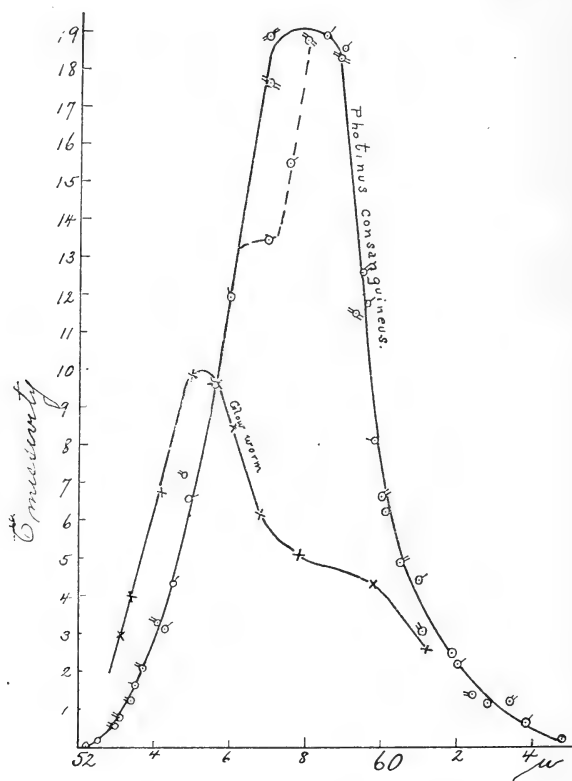


FIG. 27.—Spectral energy curves of fire-fly and glow worm.

sufficient to add that in a healthy fire-fly the abdominal segments containing the photogenic organ are at a higher temperature than the dark segments, whether or not the flashing is in progress.

In conclusion, it may be added that for the first time we have substantial evidence that the colour of the light of various fire-flies is different; the maximum emission of the

<i>Pyrophorus noctilucus</i>	being at	.....	.538μ.
<i>Photuris pennsylvanica</i>	"	.....	.552μ.
<i>Photinus pyralis</i>	"	.....	.567μ.
<i>Photinus consanguineus</i>	"	.....	.578μ.

Mailed October, 4th, 1911.

The Canadian Entomologist.

VOL. XLIII.

LONDON, NOVEMBER, 1911.

No. 11

FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MILLARVILLE, ALTA.

(Continued from page 339.)

248. *Euxoa vallis* Smith.—The type from Laggan is a female, and not a male as I stated in my previous notes. Besides that, I have seen a female taken here on Oct. 5th, 1907, now in my collection, and a male taken by Mr. Sanson at Banff on Sept. 8th, 1909. This appears to be a valid species, so far as I can judge. After seeing my own female and the type, I had supposed them to be large suffused specimens of *vulpina*, but Mr. Sanson's male made me change my opinion.

249. *E. pestula* Smith is, I have been very much surprised to find, the correct name for what I had listed as *pleuritica*. Prof. Smith has a pair of types in his collection from Calgary, and the rest of his series under the name when I saw his collection were the same species. But most unfortunately all five co-types which Prof. Smith sent me when he described it, along with several others bearing his own *pestula* label, are *focinus*, or at any rate of that group, which accounts for my confusion of *pestula* with *focinus* (XXXVII, p. 60, 1905). There is a resemblance between certain specimens, but their distinctness is unquestionable. My comparison of this species with *messoria* holds good.

Sir George Hampson figures Grote's male type of *pleuritica* under the erroneous name of *insignata* Walker. This *insignata* of Walker's is a rubbed female from Nova Scotia, but is easily recognizable as *ochrogaster* Guen., as pointed out by Prof. Smith in Journ. N. Y. Ent. Soc., XV, 143, 1907. My likeness of *pestula* to Hampson's figure is quite justified (XXXVII, 56), but I fear I must retract the statement that it is "without doubt" the same, as, though closely allied, I believe them to be distinct. As it happens, the figure is a bit more variegated than the specimens, and too ochreous, and the pale gray shades on costa and inner margin are exaggerated. I should probably suspect *pestula* of being *pleuritica*, were it not that I believe I recognize the latter in another very closely allied species occurring here, to be treated of under additions.

250. *E. incallida* Smith.—I shall have to let the species stand under this name at present. By comparison of types I decided that *incallida* and *lutulenta* were probably the same species as suggested by Dr. Dyar in the Kootenai List. But Dr. Barnes, who has a series under both names from the type locality, Sierra Nevada, California, thinks them distinct, and makes *quinquelinea* a third species. The Calgary species is exceedingly variable, and seems to be the same as the one recorded from Kaslo, and is probably identical with the Nevada female figured by Hampson as *lutulenta*. I have examined the specimen figured by him as *incallida*, and it is undoubtedly the Manitoba form I referred to, which still looks to me distinct, nor can I give it any known name which satisfies me. These specimens, however, come in an extremely difficult and variable group, including a number of names, as to the status of which I have formed no definite opinion, and with which I do not care to tamper just now.

251. *E. lagganæ* Smith.—I have examined the type from a drawing from which Sir George Hampson's very bad figure is copied. I did not recognize it as anything known to me, but am inclined to associate it closely with *fuscigera* Grt., of which I make *terrenus* Smith a synonym, by comparison with both types. The type of *fuscigera* in the British Museum is a male from Sausalito, Calif., but is not the specimen figured by Hampson, which is from the same locality, but may not be the same species. The type of *terrenus* is a male in the Washington Museum, from Pullman, Wash. Terr. One of my series of *fuscigera* from Stockton, Utah, is extremely like Smith's figure of *lagganæ*.

252. *E. testula* Smith, = *acornis* Smith.—My notes say the type is "a grayish-brown, even *acornis*." In the type of the latter the spots happen to be outlined with pale annuli, a rather unusual feature in the species, but present in several of my picked series. In *testula* they are outlined in dark. The species has occasionally been rather common in September.

253. The specimen referred to under this number still remains unique so far as my collection is concerned. I doubt its being *difformis*.

254. *E. recticincta* Smith.—I re-examined the type of this when at Washington, fifteen years after seeing it first, and I had certainly seen none meanwhile. My suggestion that it might be *acornis* proves wide of the mark. I do not feel sure that it may not prove to be *pedalis* Smith, of which the only type, a male from Colorado, stands by itself in the same collection. The latter is larger, and reddish rather than yellow-luteous.

Both may be the same as *teleboa* Smith, described from a female from New Mexico, which I have seen in the Brooklyn Museum. Hampson's figure of the latter, taken from a coloured drawing of the type, is rather too faintly marked. *Teleboa* was described one page before *pedalis*, and resembles *recticincta* more closely than does the other. Hampson places the three next one another, on the strength of figures sent him of the types, but had no specimens.

255. *E. holoberba* Smith.—I have not come across this species here for some years, and have only a single Calgary specimen in my collection. I have, however, a beauty from Nelson, B. C., almost exactly like it. It is a close ally of *sponsa* Smith, and may possibly prove to be the same, but my specimens of *holoberba* denote a larger, more robust insect, though of course that character may be variable. The type of *sponsa* is from the State of Washington, and that of *numa* Strecker from Seattle in that State. I believe them to be the same species, and identical with the type of *micronyx* Grote from California. All three types are females. That of *sponsa* is at Washington, *numa* in the Strecker collection at Chicago, and *micronyx* in the British Museum.

256. *E. neotelis* Smith (Pr. U. S. N. M., XXII, p. 446, 1900, *Carneades*).

E. objurgata Smith (Id., p. 448).

E. cariosus Smith (Id., p. 449).—A pair of types of each of these three names, all from Pullman, Washington State, are in the Washington Museum, and co-types are there and in Prof. Smith's collection. Colorado is given under the description as another locality for *neotelis*, and Dakota for *objurgata*.

E. focius Smith (Journ. N. Y. Ent. Soc., XI, p. 7, 1903).—No. 264 of my list. This was described from a long series from Calgary; Pullman, Washington; Glenwood Springs, Colo., and Truckee and Sierra Nevada, Calif. I have notes on a female type and a co-type from Pullman, in Prof. Smith's collection, but omitted to write notes on the male type. I must apologise to Prof. Smith, as I know he has been unable to see with me in this matter, but I feel bound to express my opinion that the above four names refer to the same species, and moreover, that they do not even denote anything approaching the wide range of variation which I believe the species to possess. Compare my previous notes under *objurgata* and *focius* in CAN. ENT., XXXVII, pp. 57, 59, and on p. 60, under *pestula* in error, as all specimens I then had under that name are really this species. The female types *objurgata* and

neotelis look to my eye very nearly exactly alike, and co-types of some of the names seem equally like types of the others.

It is necessary that I should here refer to that much maligned type, *Mamestra insulsa* Walker. It is of course, as all are agreed who have seen it, not a *Mamestra* at all, but of the Agrotid genus called *Euxoa* by Hampson and Smith. It was first referred by Smith in his Catalogue to a species apparently very widely distributed and common throughout the temperate portion of this continent, which has long stood under that name in probably all carefully named collections, but which should henceforth be known as *declarata* Walk., of which *decolor* Morr., probably, and *campestris* Grt., certainly, are synonyms (No. 261 of this list). But Sir George Hampson in his Catalogue, Vol. IV, puzzled some of us much by quoting *insulsa* as a synonym of *messoria* Harr. Prof. Smith, in Journ. N. Y. Ent. Soc., XV, 142, reviewing Hampson's work, states that, after re-examination of the type he concludes that his own reference to the *campestris-decolor* series was correct, and that "*insulsa* has nothing to do with *messoria*." The reference of the name by two different men to such distinct and dissimilar species led me to conjecture that either the type must be a badly rubbed specimen, or the available daylight in the British Museum bad. During my visits there in February and March, 1909, I was much surprised to find that neither was the case. The light at the table where I studied was, on a clear day, distinctly good, as is also the specimen, a female, labelled "W. Canada, Orilla, Bushe," from which the description was presumably taken in 1856. Bearing Prof. Smith's notes in mind, I studied it long, in different lights, at different angles, on different days, and even re-examined it after an interval of several weeks. I never for one moment could associate it with either *messoria* or *declarata*. But what I did associate it with, both at very first sight and always subsequently, was the species at present under discussion, my numbers 256, 264 and 265, which I have long been in the habit of calling the "*focinus* group." Yet I felt sure I had never seen anything to quite match it, but believed, and still believe, that it will ultimately be declared to belong here, in which case of course it will have preference. I have been on the lookout ever since for something to match the type, according to the impression it made on my mental vision, and have hunted specially amongst Ontario material of the *tessellata* series, but without success. My notes taken on the spot say: "It looks to me much more like *focinus* Smith (? = *tessellata* Harr.), of the uniform type, with no black at all, and pale s. t. line. It is a good specimen, and perhaps best matched with

some of the bluer forms of *focinus*, which Smith named *objurgata* for me." But the nearest approach I have yet seen to it is a male co-type of *neotelis* from Pullman, Washington, in Prof. Smith's collection, though that is a good deal paler. The comparison was from memory alone. The type locality of *insulsa* is presumably intended for Orillia, Ontario, whence material may reasonably be looked for to decide the point. It is of course not impossible that the locality is entirely wrong, and it may have been taken west of the Rockies.

Names which I associate closely with this group are *tessellata* Harr. (No. 263) and *nordica* Smith (271) q. v.

257. This species is certainly not *intrita* Morr., for note on which vide under *reuda* infra. I have not yet found a name for it, and use a manuscript one for myself. It is an ally of *intrita* and *basiflava*, and occurs on Vancouver Island. It is rare in collections.

258. *E. mollis* Walk.—Several specimens were taken at light here on July 5th, 1910. Sir George Hampson's figure is fair of the female type from St. Martin's Falls, Albany River, on the northern boundary of Ontario. *Fernaldi* Morr. has been correctly referred to the same species. There is a female type from Oldtown (? Maine) in the British Museum, and another, without locality label, in the Neumoegen collection at Brooklyn.

259. *E. reuda* Streck.—The specimen I recorded by this name, which is still a unique so far as my local material is concerned, is probably correctly named. I have a female taken last year by Mr. Thomas Baird at High River, about thirty miles from here and farther from the foothills. This is smaller and more like some specimens received of the same season's catch at Husavick and Winnipeg Beach, Man., from Mr. Wallis, matching some of my long Vancouver Island series closely, except in the slightly smaller size. In my hurry during my short day at the Field Museum, I unfortunately overlooked the types of *reuda* in the Strecker collection, but my own specimens so referred, and all I have seen in other collections, have been, I think, conspecific with *intrita* Morr., of which the type, a male from Vancouver Island, is very well figured by Hampson, and is a dark ferruginous brown form with indistinct maculation. *Reuda* was described from Seattle, Washington, and the description reads like the same species with more distinct maculation and black in the cell, the females being stated to be much paler. *Strigilis* Grt., type a female in the British Museum from Vancouver Island, is a rather dark though well

maculate specimen of the same species, and is well figured by Hampson. *Titubatis* Smith, described from two males from Oregon, with mention of Colorado specimens having been seen, is about intermediate between *strigilis* and *intrita*, and is the same species. I have seen both types, one at Washington, the other in Brooklyn Museum. I have a fine series from Vancouver Island, and the variation covers all the above and more. My series includes specimens well matched with all types except *reuda*. The synonymy of this species, in order of publication, appears to be

intrita Morr.

strigilis Grt.

titubatis Smith.

reuda Streck.

Alticola Smith, described from the Sierra Nevada, Calif., is a very near ally of the above, and may be the same species. I have seen seven specimens marked "type" in the Rutgers College, Washington, and Henry Edwards' collections, as well as a number of others from the same locality. The colour is "a mixture of red and clay-yellow, varying to a definite bright red-brown or deep brick-red," as described in Smith's Monograph. The variation seems to run suspiciously near some Vancouver Island specimens of *intrita*, and individuals are in the Henry Edwards' collection from both localities, very much alike. In fact, as my notes say, "*alticola* suggests to me the reddish end of the *titubatis* series." Hampson's figure is excellent of a Sierra Nevada male in the British Museum, but the open, v-shaped orbicular is the artist's copy of an illusion caused by an abrasion of the scales in that region on the left wing, the right orbicular seeming to me round.

260. The species I had listed as *Euxoa rena* Smith seems to be the one which that author has described as *cervinea* in Trans. Am. Ent. Soc., XXXVI, 262, Nov., 1910. The description was made from five males and one female from Bozeman, Mont.; Vancouver, B. C.; Banff and Calgary, Alta. Of *rena*, described from the Sierra Nevada, Calif., I have examined six or seven types in the Washington, Rutgers College and New York collections. I did not feel confident that these were all the same species. At any rate, a female type in the Henry Edwards' collection struck me as being probably distinct from two male types there, and more like some of the gray forms of the *neotelis* and *tessellata* group. In Prof. Smith's collection, he had a Calgary female (probably the one mentioned under the description of *cervinea* as possibly distinct) standing under *rena* and specimens from Olds, Alta., under *dissona*, under which name my No.

260 has often been recorded. A Calgary specimen of my own I compared with his male type of *rena* there, but did not feel quite sure that they were the same. Whether *cervinea* = *rena* in part or not, is, to my mind, a doubtful point, and I think the types of *rena* may prove a mixture. *Cervinea* is certainly allied to *munis*, as Prof. Smith states, the latter being a larger species, with black or blackish in the cell. The type of *munis* is from Colorado, a female, in the British Museum.

Just what *dissona* is I cannot quite discover. It was described from Labrador, and the type is presumably in Möschler's collection. A Labrador specimen in the British Museum from the Grote collection is well figured by Hampson, and might pass for a poorly-marked *rena* or *cervinea*. The *dissona* of Prof. Smith's collection did not help me, and a Labrador female standing under the name in the Strecker collection seemed to me some species not closely allied to *rena* at all. Staudinger gives it priority over *opipara* Morr., which he makes a variety, but in this Sir George Hampson does not concur.

261. *E. declarata* Walk., syn. *decolor* Morr. and *campestris* Grt. (= *insulsa* Smith, nec. Grt.).—This is the species which has long stood in nearly all North American collections, and has been treated of in literature as *insulsa* Walk. But I have endeavoured to demonstrate above (under 256) that *insulsa* is distinct, and not very closely allied. *Declarata*, of which the type is a female in the British Museum from Vancouver Island, is wrongly treated by Hampson as a synonym of *tessellata*. It is the species figured by Holland on Plate XXIII, fig. 3, as *insulsa*—erroneously, as per other authors—and also fig. 10, as *ochrogaster*, though how it came to pass muster as the latter species is a mystery. *Campestris* Grt., type a female in the same collection from New York, is the same species. The type of Morrison's *decolor* I have not seen, nor the description, and merely follow Prof. Smith and others in referring it as a form of *declarata* with contrasting shades, not uncommon in the species. Such a form is figured by Hampson, though the figure seemed to me too contrasting for any specimen in the Museum collection. If the same, *declarata* has preference by nine years.

Expulsa Walk., type a female in the British Museum, from Vancouver Island, has been referred by Prof. Smith to *insulsa*, and by Sir George Hampson to *messoria*. I wholly agree with the latter. I had already in my collection a good series of *messoria* from Vancouver Island, where a dark variation is rather common, and recognized it at once. It is a rather uniform and dark specimen with even smoky secondaries, and dark shading

between the spots. Both authors claim a close resemblance between this type and that of *insulsa* (CAN. ENT., XXXVII, 59, line 11, 1905, and Journ. N.Y. Ent. Soc., XV, 143, 1907). Closely analysed, I must admit a general similarity in both maculation and colour, though I did not notice it at first. Such similarity, however, is often to be noticed in this genus, between occasional specimens of species not really closely related. In this instance I should not have thought of associating them.

263. *E. tessellata* Harr.—When I published my former notes on this species, I was evidently under the impression that I could separate it from *focinus*. Without going so far as to claim that they are identical, I must regret my inability to draw any line between them, and shall not be surprised if they ultimately prove the same. I have seen neither the type nor original description of *tessellata*, but believe it to have been described from the Eastern States. I have a series from Ontario, and can match some of the specimens very well with local material. Typical *focinus* is slightly larger, and more blue-gray, but the variation here seems to be enormous, and to include forms, many of which appear to be locally constant elsewhere. Many of these have been described, and their validity seems to be taken for granted.

In Prof. Smith's Catalogue, three names are given as synonyms under this heading, though one of them, *nigricans*, appears to be a citation in error of Riley's. Including these, Sir George Hampson gives eight, of which, however, I have placed *declarata* Walk. as a distinct species, probably prior to *decolor* Morr. This leaves seven supposed synonyms. As a frank admission of my lack of understanding of this group, or, at any rate, of my inability to make the necessary association of characters by which the various forms may be distinguished from each other so as to suggest distinctness of species, I may state that, in addition to those seven, I have nine other names, as to the validity of which I do not feel at all assured, and which I have indexed as possible synonyms. Of some of this total of sixteen I know absolutely nothing, and merely follow Smith and Hampson. Of most of the others I have seen the types, have often compared one with another, and taken extensive notes. Of a few I feel more or less convinced of the identity, with others I must look forward to a better acquaintance. This certainly comprises the largest group in all the Noctuidæ that I have studied in which I have failed to arrive at definite conclusions. As to *insignata* Walk., referred to in my former notes, it appears that Walker gave the name to two species referable to

this genus, on two different pages of the same volume. Both these have already been correctly referred by Prof. Smith, one to *ochrogaster*, the other to *tessellata*. The type of the latter *insignata* Walker described again in the following year as *illata*, thus combining two synonyms in a double type. I have this type very closely matched with a specimen from Cartwright, Man. *Perlentans* is another type which I have fairly closely matched with a Calgary specimen in my No. 243. As to Riley's citation of *nigricans* Linn., I have two fine males from Redvers, Sask., from Mr. Crocker, one of which has travelled with me to the British Museum and all over the eastern collections without finding anything to match it more closely than some of a European series under that name in the British Museum. Yet I do not feel at all assured that the specimens are not dark variations of *tessellata*, Dr. Dyar's *focinus* of the Kootenai List includes specimens which I should most certainly call *tessellata*. My notes under Nos. 243, 256, 264 and 271 should be here referred to. The group is rarely common here, but I have examined probably some hundreds of local captures, and many from Saskatchewan and Manitoba, from British Columbia, and sundry places in the Western States.

264. *E. focinus* Smith.—Vide *tessellata* supra and *neotelis* (No. 256).

265. *E. pestula* Smith.—This is a good species, and is the 249 of this list. But all the specimens referred to by me under this heading in XXXVII, p. 56, 1905, were, I believe, *focinus* Smith.

(To be continued.)

CANADIAN TIPULIDÆ.

I have been appointed by Dr. Hewitt to compile the list of crane-flies for the new Canadian catalogue. Our knowledge of the *Tipulidæ* of any country is exceedingly limited, and Canada is no exception to the rule. I should be glad to determine material for collectors from either alcoholic or dried specimens, and will return named duplicates if so requested. The smaller, inconspicuous species (sub-family *Amphinominæ-Simnobiinæ* of authors) are especially desired. Authenticated data will be gratefully received.—CHARLES P. ALEXANDER, Dept. of Entomology, Cornell University, Ithaca, N. Y.

MISCELLANEOUS NOTES ON THE HYMENOPTERA CHALCIDOIDEA: THE GENUS *ARTHROLYTUS* THOMSON;
HORISMENUS MICROGASTER ASHMEAD.

BY A. ARSÈNE GIRAULT, BRISBANE, AUSTRALIA.

(Continued from page 354.)

3. *Arthrolytus rugifrons* Thomson.

Thomson, 1878, p. 160.

De Dalla Torre, 1898, p. 155.

Schmiedeknecht, 1909, p. 359.

"3. *A. rugifrons* m: Viridis, antennis scapo pedibusque pro parte pallidis, abdomine rotundo-ovato, ventre et basi sæpe pallidis. ♀ Lon., 2-3 mill.

"Species statura, omino *Merapori*, sed antennis postannello haud parvo, ab affinibus capite fortiter subrugoso-punctato, ocellis fere in triangulum dispositis, mandibulis haud validis; antennis infra medium faciei convexæ insertis, articulo 10 toto vel subtus pallido, ocellum haud attingente, 20 haud parvo, 30 vix conspicuo, 40 discreto, 5-10 sensim crassioribus, 50 vix, 100 fortius transverso, clava haud parva; thorace collari angusto, medio subacuto, scutello convexo, metathorace brevi sed haud declivi, punctata, plica et carina media distinctis; alis hyalinis, apice ciliato, speculo parvo, cellula basali postice pilosula; abdomine thorace fere latiore, subtus parum convexo, ventre et postpetiolo pro parte pallidis; pedibus minus validis, coxis æneis, femoribus tibiisque fuscotestaceis optime distinguenda.

"Temligen sällsynt i norra och medlersta Sverige."^c

(Thomson. 1878, p. 160).

With the exception of the citations, I have been unable to find further notice of the species in the literature.

4. *Arthrolytus puncticollis* Möller.

Möller, 1882, p. 180.

Sandahl, 1883, pp. 124, 223.

De Dalla Torre, 1898, p. 155.

Schmiedeknecht. 1909, p. 359.

"2. *Arthrolytus puncticollis*. Nigro æneus, scutello obscure purpurascens, scapo antennarum pedibusque partim rufescentibus, abdominis basi viridi, nitido; thorax subtilissime alutaceus punctis majoribus parce impressis; alæ hyalinæ; antennæ flagello tenui. ♂ ♀. Long., 1.5-3 mm.

c. Tolerably rare, in northern and middle Sweden.

November, 1911

"*Mas.*: corpore sæpissime minore, antennis longioribus et tenuioribus, flagelli articulis pube albida adpressa vestitis.

"*Arth. albiscapo* (Thoms.) affinis, sed antennis tenuioribus, alis immaculatis præcipueque punctura thoracis insignia bene distinctus.

"Lefver som parasit på *Anobium paniceum*.

"Ett kasseradt af Anobii-larver genomborradt parti af *Radix Iridis* florentinæ tillvaratogs sistlidne April för undersökning af larvernes utveckling. Den 13 i samma manad framkröp ur ett af boorhalen en liten Pteromalinhona af underslägtet *Arthrolytus* (Thoms.), hvilken i flera hänseenden var olik förut kända arter. Den 23 April visade sig den första lille hanen och under aterstoden af manaden kläcktes sparsamt sma hanar och honor. Under Maj-Juli framkommo begge könen talrikare och i mera utbildade former. I Augusti utkläcktes de största honorna; derefter aftog freuqensen allt mera till den 10 September, da de sista parasisteklarne observerades" (p. 180). (Notes on the dates of issuance of the parasite.)

5. *Arthrolytus apatela* Ashmead.

Ashmead, 1893, p. 162.

Webster, 1893, p. 158.

De Dalla Torre, 1898, p. 155.

Schmiedeknecht, 1909, p. 359.

"Genus *Arthrolytus* Thompson.

"(6) *A. apatela*, sp. n.—♀. Length, 1.5 mm. Black, shining, although exhibiting a fine scaly punctation; scape and legs honey-yellow, or pale ferruginous; all femora, and the posterior tibiæ broadly at the middle, brown; flagellum subclavate, brown. The head is broad, much wider than the thorax, the vertex being broad and rounded. The antennæ are inserted a little below the middle of the face, the funicular joints being short, not or scarcely longer than wide, the club somewhat large, fusiform. Thorax short, the mesonotum being about twice as wide as long, with the parapsides indicated only anteriorly; collar distinct but narrowed medially; scutellum convex; metathorax short. Wings hyaline, the marginal vein twice as long as the stigmal, the postmarginal not longer than the stigmal. Abdomen conic-ovate, a little longer than the head and thorax united.

"Hab.—Wooster, Ohio.

"Bred by Prof. Webster, from the larva of *Apatela populi* Riley."
(Ashmead, 1893, p. 162.)

Although, in the original description just given, the specimen is recorded from a lepidopterous larva, it appears from Webster (1893) that its relationship is not so clear, he having found the original specimens under the body of the host larva, the latter "Killed by *Rhogas intermedium* Cresson." The species must be considered, therefore, doubtfully primary on lepidoptera, the alternative being an ichneumonoid. Webster writes: "It does not appear to be abundant."

6. *Arthrolytus æneoviridis*, species nova.

Normal position. *Female*:—Length, variable, 2.00 mm. average; normal in length for the genus.

General colour dull dark green, nearly black, with brassy reflections, and in certain lights metallic. Trochanters with some yellowish; knees, tibiæ and tarsi pallid yellow, the lateral aspect of the tibiæ and the last two tarsal joints dusky; flagellum of antennæ dull fulvous, the pedicel darker and the scape concolorous with the body, fulvous at base and apex; eyes dull chestnut red, the ocelli ruby red; wings hyaline, the venation pallid yellow. The abdomen with more greenish and in certain lights with metallic bluish reflections and with some yellowish at dorsal meson near base; ventum concolorous with the general body colour. Tegulæ dark.

Head (cephalic aspect) rounded, slightly convex, the antennæ inserted nearly in the middle of the face, slightly above (dorsad of) an imaginary line drawn between the ventral ends of the eyes, the scape reaching nearly to the cephalic ocellus; margins of head rounded or obtuse; eyes ovate, in the lateral aspect, but their long axes pointing ventro-mesad and not parallel with the dorso-ventral axis of the genæ and less than half the length of the genæ, their surface fine, more delicate than that of the head and practically naked, clypeus slightly emarginate at meson of the apical margin. Dorsal aspect, head twice as wide as long, the occipital margin not acute, the vertex wide between the eyes, the head one-third wider than the thorax; ocelli in a small triangle in the centre of the vertex, the caudal ones not especially near the occipital margin and slightly farther from the eye margin than from the cephalic ocellus; the distance between them is one-third more than the distance between either and the respective eye margin; all ocelli round and equal. The whole of the head, occiput, pronotum, mesonotum including the axillæ and the scutellum, and the metanotum, closely, moderately coarsely, polygonally sculptured, most regularly on the mesonotum and more delicately on the head, pronotum and metanotum, the sculpture being on the latter nearly transversely

rugulose, while on the mesonotum it is nearly coarse enough to appear as dense punctures; caudal margin of the mesoscutum nearly straight, the pronotum distinct, about a fourth the length of the mesoscutum, not narrowed mesad; axillæ widely separated. Parapsidal furrows indicated cephalad by an impression, but incomplete, yet extending about two-thirds the length of the mesoscutum. Metathoracic spiracle not conspicuous, oval. Metathorax not as long as the scutellum, with a rather short and broad median carina (Coddington lens, $\frac{1}{2}$ -inch), the disk peltate with its wings slightly impressed and margined laterad, extending to within a short distance of the spiracle along the cephalic margin, and with its carinated or margined sides extending caudo-mesad to the meson at the insertion of the abdomen where the disk has a very short neck; a longitudinal spiracular sulcus on the dorso-lateral aspect of the metathorax leads from a point just caudo-mesad of the spiracle to the caudal margin of the segment. Metathoracic pleura dorsad with a few long, whitish hairs.

Abdomen conic-ovate, widest at the 4th segment and thence caudad, conic; segment 2 longest; segments 3, 4 and 5 subequal, each one-third shorter than the second segment, but wider; petiole, or the first segment, sessile; abdomen not quite as long as the head and thorax combined; hypopygium not exerted; venter not produced ventrad, not convex. Legs normal, the proximal tarsal joint of caudal legs longest, one-fourth longer than the second joint, the 3rd, 4th and 5th joints much shorter, the 4th shortest; tibial spurs of caudal legs single. Thoracic pleura sculptured like the pronotum, including also the coxæ and femora of all of the legs.

Fore and hind wings normal, usually densely ciliate in the disk and with moderately short marginal cilia, the marginal vein in the fore wing less than a half the length of the submarginal vein, moderately short and stout and about a fourth longer than the postmarginal vein; the latter equal in length to the stigmal vein, the latter bifurcate at its extremity, or rather with a slender nipple-like projection from its cephalo-lateral margin at a distance from the apex of the stigmal vein equal to the length of the projection (= *uncus* of Thomson).

Scape long and slender, cylindrical, as long as the combined length of the pedicel, the two ring-joints and the first two funicle joints; pedicel small, obconic, about a third longer than the combined length of the two ring-joints and a third shorter than the first funicle joint; the latter the longest joint of the flagellum, about as long as the combined lengths of

the pedicel and ring-joints; the first ring-joint narrow, longer distally, about a half the length of the second which is quadrate; joints 2, 3 and 4 of the funicle subequal, about a fourth shorter than joint 1 and each slightly shorter than the one in the series of three just preceding; funicle joint 5 intermediate in length between joints 4 and 6, the latter the shortest funicle joint, quadrate and about a fifth shorter than joint 5 and a third shorter than joint 1; funicle joints gradually decreasing in length and gradually increasing in width, the funicle cylindric-clavate, the joints wider at the apex; club short, distinctly wider than the funicle and about a third its length, conic-ovate, 3 jointed, widest at the apex of the first or proximal joint, which is subquadrate and equal in length to the 6th funicle joint, but about a fourth or fifth wider; the second club joint nearly twice wider than long, narrowing cephalad, narrower than the proximal joint, but a third shorter; the apical club joint small and conic, its longitudinal axis equal to the length of the preceding joint (Fig. A); flagellum hispi-pubescent, clavate, the hairs directed cephalad and closely applied to the joints, giving the appearance of longitudinal carination to them, and arranged in two rows. Mandibles 4-dentate on each side and symmetrical, the lateral tooth longest and most acute forcipiform, the two inner paired but unequal and smallest and the mesal tooth conic; teeth of mandibles fuscous. (Fig. C).

(From 9 specimens, $\frac{2}{3}$ -inch objective, 2-inch optic, Bausch and Lomb).

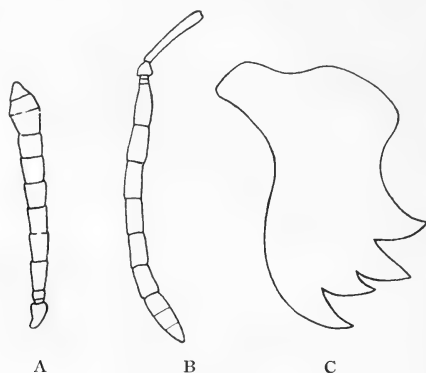


FIG 28.—*Arthrolytus aeneoviridis* Girault A.—Flagellum of female. B.—Antenna of male. C.—Right mandible of female. (The second tooth is drawn too long.

Male.:—Length, 1.6 mm. The same.

Body smaller, more slender, the abdomen ovate, concolorous, about

the length of the thorax, the antennæ not the same, but longer and filiform; genitalia exerted in death; eyes oval, *not* ovate.

Scape slightly longer in proportion to the pedicel, ring-joints and first two funicle joints, the pedicel and ring-joints relatively shorter, the first two funicle joints relatively longer, than in the female; flagellum filiform; pedicel obcuneate, small, twice the size of the combined ring-joints, but only about a third the length of the first funicle joint; both ring-joints narrow longitudinally, subequal; first funicle joint longest, twice the length of the ring-joints and the pedicel combined and a fifth longer than the second joint; funicle joints 2 and 3 and 4 and 5 subequal, each a little shorter than the one immediately preceding, but all longer than wide, the 6th only a third shorter than the first and more than a third longer than the proximal club joint; club slightly narrower, its proximal and intermediate joints subequal, the latter slightly shorter and each about half the length of the first funicle joint or less; the apical club joint distinctly smaller, subequal to the pedicel, obtusely conic. (Fig. B). Hairs of antennæ about as in the female; in balsam mounted antennæ, or under the microscope, appearing as though they were in circular rows of white ridges around the joints, in two or three series, or single as the case might be; in three series or rows on joint 1 of funicle, in two rows on joints 2-6 of funicle, and in a single row on the club joints; in the latter cases the hairs reaching to or beyond the apices of the respective joints; on the first funicle joint, the hairs originating at the base of each third and a third the length of the joint; on the remaining funicle joints at the base of each half and as long as the respective halves. Scape and pedicel practically impubis. Mandibles as in the female.

(From 3 specimens, $\frac{2}{3}$ -inch objective, 2-inch optic, Bausch and Lomb.)

Described from three males and nine females received for determination from Mr. R. L. Webster, of the Iowa Agricultural Experiment Station, Ames, Iowa, and bearing the following labels: "Exp. 204, 29, 30 July, 1908" (1 ♂, 3 ♀s); "Exp. 205, 31 July, 1908" (1 ♀); and "Exp. 332, 5-14 Oct., 1908" (2 ♂s, 4 ♀s); and "Exp. 177, July 27, 1908" (1 ♀). Appeared in breeding-cages containing the larvæ of (*Alceris*) *Perovea minuta* (Robinson), after the ichneumonoid *Clinocentrus americanus* Weed and before the entedonine *Horismenus microgaster* (Ashmead). Reared at Ames, Iowa, from host material collected at Shenandoah and Des Moines, Iowa. (Webster, 1909).

Types.—*Accession No.* 40,289, Illinois State Laboratory of Natural History, Urbana, Illinois; 6 ♀s on tags and 1 ♂, 2 ♀s antennæ in

xylol-balsam (1 slide), 1 ♀ head in xylol-balsam (1 slide). *Co-type No.* 12,199, United States National Museum, Washington, D. C.; 1 ♂, 1 ♀ tag-mounted.

SPECIES FORMERLY REFERRED TO *Arthrolytus*.

1. *Arthrolytus clisiocampæ* (Fitch).

This species was described as *Cleonimus clisiocampæ* by Fitch (1856). Riley (1871) thought the species to be more properly a *Semeotellus*: about twenty years later, Ashmead (1894) referred it to *Arthrolytus*, and subsequently in Howard, in 1897; Fiske (1903) decided it to be synonymic with *Dibrachys boucheanus* (Ratzburg). Still later, however, he again refers to it as *Arthrolytus clisiocampæ* (Fitch) (Mason, 1906). I have examined specimens of this insect in the Mason collection, determined by Ashmead and labelled variously *Dibrachys clisiocampæ* (Fitch), *Arthrolytus clisiocampæ* (Fitch), and there can be no doubt but that they are identical and belong to *Dibrachys*. The species is *Dibrachys boucheanus* (Ratzburg) of authors.

2. *Arthrolytus pimplæ* (Ashmead).

Ashmead, 1894, p. 339.

De Dalla Torre, 1898, p. 155.

An examination of the description of this species, together with notes furnished me by Mr. J. C. Crawford, of the National Museum, Washington, D. C., taken from the types, shows that it belongs properly to *Dibrachys* Foerster. The antennæ are inserted distinctly below (ventrad of) the middle of the face, from the direct cephalic aspect, the face not being produced ventrad. This character is easily seen upon comparison of the two genera. The species *pimplæ*, however, has the antennal pedicel longer than the proximal funicle joint, not true with *Dibrachys*, but the sum of its characters, so far as I know them, shows its affinities to the latter genus.

3. *Arthrolytus incongruens* Masi, 1907.

This species has 3- and 4-dentate mandibles; it is therefore not *Arthrolytus*, as at present understood.

Table of the Species.

The following diagnosis is based mostly on the literature. I have been unable to select structural characters as a basis for separation of the species, and have not much reliance on colorational differences in these metallic *Pteromalinae*. For the present, therefore, the species, as they now stand, are indexed in the following table, which should be used with caution.

Females.

A. Wings with a dusky area.

- a. Brassy-green, the scape yellow-brown. Flagellum incrassate.....*punctatus* Thomson.
- b. Verdigris-green, the scape white; flagellum not incrassate; apical tooth of mandible larger.....*albiscapis* Thomson.

B. Wings hyaline.

1. Blackish-green, with some metallic lustre.

- a. Scape reddish, or partly so, flagellum slender, not clavate; base of abdomen green, shining.....*puncticollis* Möller.
- b. Scape blackish-green, concolorous, flagellum clavate; base of abdomen with some yellow; marginal vein a fourth longer than the stigmal; pedicel a third shorter than joint 1 of the funicle; pronotum not narrowed at the meson.....*æneoviridis* Girault.

2. Black, with little or no metallic greenish.

- a. Scape honey-yellow; flagellum subclavate, brown; base of abdomen concolorous; marginal vein twice as long as the stigmal; pronotum narrowed at meson.....*apatelæ* Ashmead.

3. Verdigris or bronze-green, metallic.

- a. Scape pallid ventrad; flagellum incrassate or clavate; base of abdomen often pallid; pedicel not small; pronotum narrow, subacute at meson.....*rugifrons* Thomson.

Males.

The males of but three of the species are known; they may be recognized by the following index:

A. Wings hyaline.

1. Brassy-green, metallic.

- a. Scape reddish; abdomen with a pallid spot at base; legs reddish, the coxæ and femora brassy-green.....*punctatus* Thomson.

2. Blackish, with some metallic greenish.

- a. Scape black-greenish; abdomen concolorous; flagellum filiform; legs pallid-yellow, coxæ metallic.....*æneoviridis* Girault.
- b. Scape reddish; base of abdomen green shining; flagellum filiform; tibiæ white.....*puncticollis* Möller.

(To be continued.)

SOME LITHOBIOMORPHA FROM THE REGION OF SAN FRANCISCO BAY.

BY RALPH V. CHAMBERLIN, PHILADELPHIA, PA.

Of the six species of the Lithobiomorpha described by Stuxberg from California, the types of four were secured at Sausalito, or near by, on San Francisco Bay. Among these the identification of *Lithobius kochii* and *Lithobius obesus* has been simple; but considerable uncertainty has attached to the forms designated by Stuxberg as *Lithobius megaloporus*, later placed in his subgenus *Pseudolithobius*, and *Lithobius pusio*, placed by its author in his subgenus *Archilithobius*, this difficulty being due to the fact that the types were immature individuals, as I previously showed to be indicated by various points in one description. In order, if possible, to clear up this uncertainty, especially with reference to the species *megaloporus*, which seemed to merit generic rank, I took advantage of an opportunity presented in April of this year to make collections at Sausalito and several other points on the San Francisco Bay (Mill Valley, Oakland and Berkeley). Ample material of the species described by Stuxberg, as well as of other species, including several interesting new ones, was secured.

The anticipations with reference to the species *megaloporus* and *pusio* were fulfilled. Stuxberg gives the length of *megaloporus* as 12 mm., whereas that of adults is from 35 to 39 mm. The species must be given separate generic rank, and will stand as *Pseudolithobius megaloporus*. The species *pusio*, as anticipated, proves to belong to the genus *Bothropolys* and to have been based upon a young specimen of a distinct species, and not of *B. monticola*, as was thought possible. *B. monticola* seems not to occur in the Coast Mts. or region, but to be confined to the Sierras and the country northward, being common in Oregon and Washington. Brief descriptions of these two species are given below.

Of the new forms discovered quite unexpectedly, the most interesting is *Buethobius coniugans*, the second species of the genus to become known. Unlike *B. oabitus*, the type species, the new species shows conspicuous sexual dimorphism. The males are uniformly larger than the females, and are remarkable for the very long and distinctly three-jointed gonopods, differing from those of the female in lacking terminal claws and basal spines. In this regard the species suggests a transition from forms presenting no dimorphism to those such as *Lithobius*, in which it is more marked and the male gonopods mostly small and wart-like and

but two- or more often, one-jointed. *Zygethobius sokarienus* is the third species of its genus to be made known.

1. *Bothropolys xanti* Wood.

One specimen was taken at Mill Valley. This species is abundant southward, the author having numerous specimens from Stanford, Pacific Grove and Monterey, Santa Barbara, San Bernadino, Los Angeles, Santa Monica, Claremont, etc.

2. *Bothropolys pusio* (Stuxberg).

1875: *Lithobius pusio* Stuxberg, Ofvers. af Kgd. Vet.-Akad. Forhandl., No. 2, p. 67, No. 3, p. 31.

1909. nec. *Lithobius pusio* Chamberlin, Ann. Ent. Soc. America, p. 187.

Brown, often of reddish caste, the head not darker, concolorous with dorsum; some of the major dorsal scuta in some, with the caudal border very dark, and some with a median dark stripe. Antennæ reddish brown, pale distad. Prosternum and prehensorial feet brown, the posterior ventral plates of same colour; the legs and most of venter lighter brown, the caudal pairs of legs commonly pale distad.

Antennæ short, composed of 20 articles of moderate length, which gradually decrease in size from the second to the ultimate.

Ocelli distinct, usually thirteen in number, and arranged in three series, thus, 1 + 5, 4, 3.

Prosternal teeth 6 + 6-6 + 7, stout, darkened, uniform in size and spacing, all apically, bluntly rounded.

Angles of none of the dorsal plates produced.

Coxal pores of various sizes, small and very small, mostly arranged in two or three series. The caudal series on each coxa consists of the larger pores, usually 4 or 5 in number; the next series is composed of smaller pores, and the third or most anterior of the smallest; the second and third series often confused or forming a single irregular row. Pores in number usually from 7 or 8 (12th coxa) to 12 (13th-15th coxæ) in number on each coxa.

Last two pairs of coxæ armed laterally and ventrally; the last three pairs armed dorsally.

Spines of the first legs 2, 3, 1; of the penult 1°, 3, 3, 2, with two claws; of the anal 1, 3, 2, 1, the claw single.

Genital appendages of the male as usual in the genus, distinctly two jointed.

Claw of gonopods in the female tripartite. Basal spines 2+2, cylindrical or clavate at base, the upper portion conical and excavated on one side, and sometimes with accessory points at base of conical portion.

Length, 17.5 mm.; width, ad 2 mm.

Localities.—Sausalito (type locality) and Mill Valley.

The species was found to be common in both these localities. The identification of this species with Stuxberg's *pusio* would have been difficult, or more probably, impossible, had it not been for the statement in regard to the spining of the posterior coxæ: "Pedum analium articulus primus calcaribus binis, majore ventrali, minore laterale, armatus." As among the North American Lithobiomorpha known to the author, only the species of *Bothropolys* have the posterior coxæ armed with a ventral spine, he concluded that the type of *pusio* belonged to this genus, and, since Stuxberg represents the coxal pores as being in a single series and few in number, that it must be immature. As the species above described is common in the type locality and the only member of the genus of the coastal region having all dorsal plates straight, its identity with *pusio* is obvious. Young specimens agree fully with Stuxberg's account.

3. *Lithobius kochii* Stuxberg.

1875. Ofvers. af Kgl. Vet.-Akad. Forhandl., No. 2, p. 69; No. 3, p. 30.

A half dozen specimens conforming fully to the original description were taken at Sausalito, the type locality. It had previously been taken at Ukiah (probably), Stanford, Pacific Grove and Claremont.

4. *Lithobius obesus* Stuxberg.

1875. Ofvers. af Vet.-Akad. Forhandl., No. 2, p. 67; No. 3, p. 31.

This very distinct species was found to be very common at Sausalito, the type locality, from where it seems to range southward to Los Angeles Co., the author having in his collection specimens from Stanford, Pacific Grove and Monterey, Los Angeles, Laurel Canyon, San Bernadino, Claremont and Catalina Island.

5. *Lithobius tiganus* Chamberlin.

1909. *Lithobius utahensis* Chamberlin (ad max. part.), Ann. Ent. Soc. America, p. 187.

1910. *Lithobius utahensis*, var. *tiganus* Chamberlin, P. C. Journ. Ent., p. 374.

Very common under damp leaves, etc., at Berkeley, Sausalito and Mill Valley. Previously known from various other points in California.

6. *Lithobius patonius*, n. sp.

Dorsum dark brown; the head paler and more reddish. Antennæ brown proximally, pale brown or yellowish distally. Venter dark brown, usually a little paler than the dorsum. Legs whitish to grayish brown, the ultimate pairs bright yellow distad.

Antennæ short; composed of twenty articles, which gradually decrease in length from the second to the ultimate, not inclusive.

Ocelli 4 to 6 (7) on each side, in one straight series or sometimes more irregular, and in two imperfect series, thus, 1+3 or 1+3 (2), 2, those of the upper series well separated and the median one imperfectly divided from the contiguous one of lower row.

Prosternal teeth moderate in size, acute, and but little darkened; 2+2, uniform in size and spacing.

Angles of none of the dorsal plates produced.

Coxal pores small, round, 2, 3, 3, 3.

Last two pairs of coxæ laterally armed; last three pairs dorsally armed.

Tarsi of anterior legs undivided (*Monotarsobius*).

Spines of first legs 1, 1 (2), 1; of penult 1, 3, 3, 1, with two claws; of the anal 1, 3, 2, 0, the claw single. Anal and penult legs in both male and female strongly and uniformly crassate, but little larger in male than in female.

Claw of female gonopods relatively wide, tripartite; basal spines 2+2. Length, 5-6.5 mm.

Localities.—Sausalito, Mill Valley, Berkeley.

Common under layers of damp leaves. Related to *L. tiganus* and *L. utahensis*, but readily distinguishable by the decidedly and constantly smaller size.

7. *Lithobius angelus*, subsp. *satanus*, subsp. nov.

Dorsum brown, the caudal margins of major plates cephalad of middle darker. Head dark brown, paler in front of the frontal suture. Prehensorial feet orange, the prosternum brown. Antennæ dark proximally, becoming pale distad. Posterior pairs of legs with their distal joints conspicuously orange-coloured.

Antennæ short, composed of 34 or 35 compactly arranged articles, of which the second is largest, those beyond the third short or very short.

Ocelli 6 on each side, arranged in two series, thus, 1 + 3, 2.

Prosternal teeth 2 + 2, moderate in size, darkened, the inner one on each side larger than the outer.

Angles of the ninth, eleventh and thirteenth dorsal plates produced.

Coxal pores 3, 3, 3, 3, circular.

Last pair of coxæ armed laterally with a short, stout spine; last three pairs armed dorsally with much longer spines.

All tarsi biarticulate,

Spines of the first legs 0, 1, 1-0, 2 (?), 1; of the penult 1, 3, 3, 2, with two claws; of the anal 1, 3, 3, 1, also with two claws.

Anal legs in male slender and moderately long.

Locality.—Oakland, Cal.

Three males were secured, of which two are but partly grown, and the third lacks a little of maturity. The form is very close to *L. Angelus* Chamberlin, described originally from Los Angeles, but also found by the author at Croville (April, 1911); it differs in the greater number of articles of the antennæ, which seems to be constantly 28 or 29 in *angelus* and in their size and form, in the spining of the legs, the form of the anal legs, etc.

8. *Pseudolithobius megaloporus* (Stuxberg).

1875. *Lithobius megaloporus* (Stuxberg, Ofvers. Kongl. Vet.-Akad. Forhandl.; and Ann. and Mag. Nat. Hist., p. 190).

1875. *Lithobius megaloporus*, subgenus *Pseudolithobius* Stuxberg, Ofvers. Kongl. Vet.-Akad. Forhandl., No. 3, p. 8.

1910. *Pseudolithobius megaloporus* Chamberlin, P. C. Journ. Ent.

Body wide anteriorly, parallel sided over most of length, attenuated caudad. All dorsal scuta strongly margined laterally, rugose. Sternal plates, especially the more posterior ones, broadly produced caudad, so that each at the middle more or less overlaps the succeeding one.

Dorsum brown, the first dorsal plate commonly darker and more rounded, and the scuta frequently darkened along caudal border. Head and prosternum with prehensorial feet a little darker and more reddish than the dorsum. Antennæ brown, uniform. Venter and legs a paler brown, uniform in most.

Antennæ short, composed of twenty articles, which are moderate and mostly uniform in size.

Eyes small, composed of few ocelli, the number on each side being mostly 5 or 7, which are arranged in two series, thus, 1 + 3, 2-1 + 3, 3.

Prosternal teeth mostly 3 + 3 or 4 + 4, in the latter case the innermost and the outermost on each side decidedly smaller than the two inner ones.

Angles of the ninth, eleventh and thirteenth dorsal plates produced,

Coxal pores rather large, round or oval, each enclosed in a large, circular pale area, which in some might be superficially regarded as the pore; 3, 4, 4, 4, 4.

Tarsi of all legs biarticulate.

None of the coxæ armed laterally or ventrally, the last five pairs (those bearing pores) with a short, stout spine dorsally.

Spines of the first legs 3, 3, 3; of the penult 1, 3, 3, 2, with two claws; of the anal 1, 3, 3, 1, the claw single.

Anal legs of male of moderate length, slender; the fifth joint conspicuously bowed ventrad, and flattened and longitudinally furrowed above or dorsally.

Claw of the female gonopods entire or weekly notched at apex; basal spines 3 + 3.

Length of adults up to 39 mm.; width, 4 mm.; length of antennæ and anal legs ad 13 mm.

Localities.—Sausalito (type locality) and Oroville.

Two adult males were secured at Sausalito, and numerous males and females were taken at Oroville. They were found for the most part under stones and other objects lying in open treeless areas. They are slow to take alarm, often lying quite unconcerned after stones have been rolled from over them and they themselves jarred, and seem in every way more sluggish than the species of *Lithobius* and related genera.

9. *Zygethobius sokarienus*, sp. nov.

Conspicuously attenuated from region of the tenth dorsal plate cephalad; dorsum well arched, shining.

Dorsum reddish brown or chestnut, the head and ultimate segments darker, the coloration of the head uniform. Antennæ dark reddish brown proximally, becoming pale distad; prosternum with prehensorial feet, and the venter brown, often of reddish tinge, the posterior segments of the venter darker. Legs usually brown, sometimes dark except proximally and distally, and the posterior pairs usually darker than the others.

Antennæ moderately long, but not quite equalling half the length of the body. Articles 38–39, the first two long, the next twelve abruptly and also narrower, those beyond the fourteenth longer and more loosely

joined, and showing a marked tendency for two shorter articles to alternate with one longer one.

Ocellus on each side large, bluish, often showing a slight tendency toward doubling.

Prosternal teeth 3 + 3.

Angles of ninth, eleventh and thirteenth dorsal plates produced.

Coxal pores round, moderate in size; 3, 3, 3-3, 4, 4, 4.

Legs as usual; tibial process well developed, apically spinescent in anterior pairs; all feet ending in three claws; anal legs long and slender.

Claw of gonopods long, entire; basal spines 2 + 2, stout and conical.

Length, 13 mm.; width, 2 mm.; length of antennæ 6-6.5 mm.

Locality.—Mill Valley, Cal.

Ten specimens were secured under leaves and sticks in a very damp, shaded locality such as preferred by the other species of the genus.

This, the third species of the genus to be made known, is very close to *Z. dolichopus* Chamberlin, found originally in the Wahsatch Mts. at elevations above 8,000 feet; but it is larger and more robust, and presents constant differences in coloration and in some structural details.

10. *Buethobius coniugans*, sp. nov.

Light orange in colour, the head and caudal segments darker, but the head pale in front of frontal suture. Antennæ and legs yellow, the caudal pairs of the latter usually darker, orange, especially so proximally.

Antennæ short or moderate in length, being considerably variable, composed of 43-45 articles, of which the first two, or more rarely three, are largest, those immediately succeeding the second or third being very short, the more distal ones becoming again longer; the last two longer than those immediately proximad of them.

Ocelli none.

Prosternal teeth 3 + 3, small, acute, in some darkened apically.

Angles of none of the dorsal plates produced.

Coxal pores 2, 2, 3, 2-3, 3, 3, round.

Ultimate coxæ produced into an acute process at distal end, this projecting caudad as in some Scolopenoridæ.

Tarsi mostly biarticulate, though often very indistinctly so in anterior pairs, and in some the articulation difficult to detect in any of the first thirteen pairs of legs. Each leg of the first fourteen pairs ending in three claws, the anal legs each with but a single claw.

Anal legs both in male and female long and slender.

Genital appendages of male long and conspicuous; composed of three distinct articles, of which the ultimate is conical and terminates in a stout bristle.

Claw of gonopods of female undivided; basal spines 2 + 2, conical distally, cylindrical or somewhat clavate proximally.

Length of male, 10.5 mm.; width at eighth dorsal plate, 1.4 mm. Female shorter, in length 8.5 mm., and more slender, the width at eighth dorsal plate being 1.1 mm. Length of anal legs in male ad 4.6 mm.

Localities.—Berkeley and Mill Valley.

This is the second species of *Buethobius* to become known. In the case of the type species, *B. oabitus* Chamberlin, found in Mississippi, all the specimens found had the gonopods terminating in claws, thus appearing to be females. The character of the appendages in the male is interesting, these appendages differing from those in the female only in lacking the terminal claw and the basal spines. It may be found that in *Lamyctes*, *Zygethobius*, etc., even these differences do not occur, and that the males and females have not been distinguished heretofore in consequence.

THE POTATO BEETLE, *DORYPHORA DECEMLINEATA*, EATING THE EGGS OF ITS KIND.

While ridding some early potatoes of beetles at Westbrook, Maine, in June, 1911, masses of their eggs were frequently noticed, which had part or all of their contents emptied, leaving the shrivelled coverings on the leaf. My curiosity was aroused, but was shortly to be satisfied. In the large tin pail into which the egg-bearing leaves and the beetles were thrown, one of the latter was noticed feasting upon the eggs. There was no mistake. With her mouth-parts upon an egg, and with jaws and antennæ working, the egg was seen to collapse, and she moved to the next, with like result. During the next half-hour not less than a dozen were carefully observed feeding on the eggs in the pail.

It may be of interest to remark that only females were observed to do this.—ARTHUR H. NORTON, Museum of Natural History, Portland, Me.

ERRATA.—Page 356, explanation of fig. 23, line 1, for "b" and "d" read "c;" line 2, for "c" read "b and d;" line 3, for "d" read "e."

FURTHER NOTES ON DIABROTICA.

No. II.

BY FRED. C. BOWDITCH, BROOKLINE, MASS.

The paper on Part II of the genus *Diabrotica*, Trans. Ent. Soc., London, 1891, was blocked out by Mr. Baly, and on his death was finished and published by Mr. Gahan. Mr. Baly's preliminary work was apparently only partially completed, as he omitted a considerable number of forms described by Mr. Jacoby, most of which were enumerated by Mr. Gahan in his subsequent paper published, l. c., in November, 1891; five additional species described by Mr. Jacoby, P. Z. S. 1889, p. 281, seem to have escaped notice :—

D. estabanensis Jac., San Estaban, near *ambitiosa* Er. In addition to the type, I have a second specimen which was unnamed in the second Jacoby collection.

D. varicornis Jac., San Estaban, near *inaequalis* Baly. Besides the type, I have two examples from Paramba.

D. obscuro-maculata Jac., Colonia-Tovar, near *depressa* Jac., from Mexico.

D. nigrodorsata Jac., Colonia-Tovar, should be placed apparently in K sec. My specimen is ♀.

D. simplicipennis Jac., Carózal and Colonia-Tovar, should be placed near *uniformis* Jac., from Chiriqui.

Over 500 forms are represented in my material. Their arrangement reveals many undescribed species, some of which have already been published. Those belonging to Baly's Sec. II follow :—

D. inca, nov. sp.

Head and thorax dark chocolate black, mouth parts piceous, antennæ black, piceous at base, joints 9–10 flavous, thorax deeply foveate at the side and obsoletely behind, scutel and elytra dark chocolate brown, shining, finely and somewhat obsoletely punctate-striate, tricostate, and with a broad subsutural and lateral flavous stripe which unite at the shoulder and also at the apex; body below brown, legs flavous, tibiæ and tarsi stained with piceous. Length, 4 mm.

Eight examples, Pachitea, Peru.

General form elongate, slightly dilated behind, head with fine frontal carina, and fovea at the vertex, and some fine punctures at the sides,

antennæ about three-fourths the length of the body, joints 3-4 about equal, one-half longer than the second, the 4 lower joints flavous tinged with piceous, thorax elongate, shining, slightly sinuate behind, the side fovea are much more marked than the median, the elytra have three strongly marked longitudinal costæ of which that in the third interval is the widest and extends from just below the base nearly to the apex, the other two are humeral and subhumeral, forming a deep plica, are almost carinal in form, and vanish at the convexity, the subsutural flavous stripe embraces the whole of the third interval costa, and a broad margin on either side, the fine punctuation shows its striation best by being observed at an angle in a strong light. The vicinity of the scutel is distinctly depressed, some examples have indications of other elytral costæ, but the three above described are always the most prominent. Belongs to the division of *separata* Baly.

D. carinipennis, nov. sp.

Head black, mouth parts piceous, antennæ black, more or less piceous at the base and with joints 9, 10, 11 flavous with extreme tip black, joints 3 and 4 equal, each almost twice as long as the second, thorax flavous, rufous yellow, broader than long, deeply excavate bifoveate, subangulate at the sides, elytra shining black, punctate striate, and tricostate the lateral margin, except the base and a subsutural stripe flavous, body beneath flavous in front, black behind, legs flavous, tibiæ and tarsi black. Length, 4-4½ mm.

Three examples, Bolivia, green label (Chaco?).

Close to *bivittula* Kirsch., but the thorax is comparatively wider and more deeply foveate, the eighth joint of the antennæ is black, the elytra seem more depressed, so that the two side costæ, which are humeral and subhumeral, are very sharp and have the appearance of carinæ and form a deep plica from just below the shoulder nearly to the convexity; the third interval covered by the subsutural yellow stripe is strongly costate and thickened from just below the base nearly to the tip, as in *bivittula* and its allies, but the flavous colour is more diffuse, especially at the middle half, in one example (♂?) the lower part of the face is flavous.

D. granulipennis, nov. sp.

Head shining black with a deep frontal fovea and a few gray hairs in front of the eyes, antennæ black, piceous at joints, joints 3 and 4 equal,

each about twice as long as 2. Thorax rufous yellow, deeply bifoveate and impressed in front of the scutel, sides strongly sinuate behind, scutel black, elytra maroon coloured, thickly, strongly and semi-confluently punctate, obsoletely plicate, with the lateral margin and a subsutural stripe flavous; this latter embraces two rather feebly raised smooth costæ, of which the outer is the most prominent, body beneath dark, legs dark, with coxæ and $\frac{2}{3}$ of femora flavous. Length, 6 mm.

Two examples, St. Catharine, Brazil; also 2 Amazon Valley, near Santarem.

This species has much the general appearance of *corrusca* Har., or *innuba* Fabr., but the punctuation of the elytra is very different and the costa much less prominent. What I have above designated as the inner costa is scarcely deserving of the name, as it becomes very feeble posteriorly; the reticulated effect which the punctures have in *corrusca* is wholly wanting here; the flavous vittæ attain the base, but do not join there; the subsutural stripe is quite distinctly limited at the sides, narrow and straight; the epipleuræ are flavous.

D. vittula, nov. sp.

Head rufous with a deep frontal fovea, and black vertex and labrum, antennæ slender, black, piceous at base, 3 joint not as long as 4, both much longer than 2, thorax rufous, broader than long, bifoveate and broadly depressed transversely, sides nearly straight behind and broadly rounded to the front, scutel and elytra shining black, the latter finely punctate, very obsoletely striate, strongly plicate, a yellow vitta from the middle of the base, somewhat diagonally to near the apex, where it joins the lateral margin, which is also yellow, apex is black, body beneath flavous, anus dark, legs yellow, with apex of femora tibiæ and tarsi dark. Length, $3\frac{1}{2}$ mm.

Four examples, Peru, green label (Callanga?)

Near *dejeani* Jac., and *cerea* Jac., from Central America, but a little larger; the elytra are considerably dilated at the rear and quite broadly margined, the elytral and lateral vittæ join at the base as well as at the apex and in only one example does the elytral stripe become obsolete at the convexity; in one or two of the specimens the vitta is obsoletely sinuate at about the median third; the yellow stripe, when complete, leaves a black sutural vitta from base to apex, broadest in front.

D. tucumanensis, nov. sp.

Head, antennæ and thorax black, the latter shining, bifoveate with oblique depressions, scutellum black, elytra black, shining, a common sutural vitta attaining the convexity, the lateral marginal almost to the apex and a humeral elongate spot not attaining the middle all flavous; beneath black, more or less testaceous; legs testaceous with apex of femora, tibiæ and tarsi black. Length, 4-4½ mm.

Type.—Prov. Tucumán Rep. Argentine, xii, 1889, C., Bruch. Two other examples from apparently same source.

Easily distinguished by its long, narrow, parallel form, with the short elongate flavous streak back of shoulder. In the two co-types the thorax is infuscate at the middle and the sutural vitta is complete to the apex; all have the elongate humeral streak well marked.

D. Bruchii, nov. sp.

Head black, mouth-parts piceous, antennæ slender, black, reaching the posterior third of elytra, piceous at base; joints 3-4 equal; thorax flavous, rufous, narrow, elongate, bifoveate, elytra slightly dilated behind, smooth, dull black, very finely punctulate striate (in the white vittæ), the lateral margin and a straight median vitta, joined behind, white; beneath and legs black, base of femora white. Length, 3½-4 mm.

Type.—Rep. Argentine (Geb. formosa?) 1-1905, C., Bruch, also Paraguay.

Would be placed near *granulata* Jac., from Mexico. The smooth, dull black elytra easily distinguish this from all other vittate forms known to me; the Paraguayan example does not differ materially from the type.

(To be continued.)

RECORDS OF BEES.

BY T. D. A. COCKERELL, UNIVERSITY OF COLORADO.

Osmia hesperella Cockerell.

Females were found nesting in a hole in a wall, in Boulder, Colorado, June. Specimens from the same place, and apparently the same nest or group of nests, vary in the colour of the ventral scopa, from light golden to a mixture of light golden and dark fuscous. The eyes in life have the upper third and the hind margin dull sage green, the rest black. The variation in the colour of the scopa led me to reconsider the insects separated as *O. coloradella* Ckll. and *O. ramaleyi* Ckll. According to previous observations, true *hesperella* has the scopa white, *ramaleyi* has it orange, and

coloradella has it black. In the type of *hesperella*, however, it is not a pure white, but has a pale golden tint; while in *coloradella* it is variably pallid or pale orange at the base and sides. The differences described in the venation between *coloradella* and *hesperella* also seem inconstant. I think, therefore, that all three constitute a single species, remarkable for the colour-variation in the ventral scopa.

Anthophorula bruneri (Crawford).

On Aug. 3, 1911, I found both sexes common at flowers of *Helianthus lenticularis* at Sterling, Colorado. The species is new to Colorado. The other bees taken at Sterling on the same day, all from the *Helianthus*, are *Melissodes obliqua* Say, ♀; *M. aurigenia* Cress., ♂; *Andrena helianthi* Rob., ♀; *Perdita albipennis* Cress., ♀; *Augochlora coloradensis* Titus, ♀; *Halictus armaticeps* Cress., ♀; *H. pruiniformis* Crawf. ♀.

Neopasites robertsoni Crawford.

Prof. O. A. Stevens sends me many specimens, collected on flowers of *Grindelia squarrosa* at Agricultural College, North Dakota, Aug. 18 and 19. At the same time, and on the same flowers, he collected many *Andrena hirticincta* Prov., both sexes. The latter he has also taken at *Melilotus alba*. The *Neopasites* has hitherto been known only from Nebraska.

Ceratina dupla halophila, n. subsp.

♀.—Length, about seven mm.; dark blue-green, with the usual white mark on clypeus. Differs from the usual form by the strongly infuscated wings and dark tarsi; the tegulæ are shining black. *C. submaritima* Ckll. rarely has a small spot on the clypeus of the female, and then, because of the similarly dark wings, rather resembles the present insect; but in *C. submaritima* the tubercles are wholly dark, and the face is much less densely punctured.

Hab.—Woods Hole, Mass., June (Cockerell).

Other bees taken this year at Woods Hole are the following (those marked with an asterisk collected by Miss Eleth Cattell): *Sphecodes arvensis* Patton; *S. persimilis* Lovell & Ckll. (both species of *Sphecodes* at umbelliferous flowers); *Agapostemon radiatus* Say; *A. viridulus* Fab.; *Nomada articulata* Smith; *Augochlora confusa* Rob.*; *Xenoglossa pruinosa* Say;* *Bombus fervidus* Fabr.*; *B. terricola* Kirby;* *B. vagans* Smith;* *Megachile campanulæ* Rob.* (male, remarkable for the extremely

densely punctured mesothorax); *M. brevis* Say ;* *Prosopis cressoni* Ckll.*; *P. modesta* Say ;* *Halictus armaticeps* Cress.* (ordinary form, and also female with large head, apparently identical with *capitosus* Smith); *H. coriaceus* Smith ; *H. provancheri* D. T.;* *H. cressonii* Rob.

At Bluff Point, Ram Island, I took *Augochlora confusa*.

On the Island of Cuttyhunk, Mass., July 18, I took the following : *Bombus americanorum* Fabr.; *B. separatus* Cress.; *Agapostemon viridulus* Fabr. (larger than those from Woods Hole) ; *Nomada articulata* Smith (one female, a variation with the anterior coxal spines reduced to mere minute rudiments).

It is interesting to note that the Bombi flying on Cuttyhunk were different from those at Woods Hole.

Megachile sapellonis Cockerell.

The northward range of this fine species is considerably extended by a female which I took at Tolland, Colorado, Aug. 23, at flowers of *Carduus centaurea* Rydb. This was at the altitude of about 8,900 feet. Other interesting bees which may now be recorded from Tolland are : *Osmia armaticeps* Cress. (coll. W. P. Ckll.); *O. bucephala* Cress. (coll. W. W. Robbins) ; *Stelis montana* Cress. (coll. W. P. Ckll.) ; *Chelynia pulchra* Crawford; *Coelioxys moesta* Cress. (coll. W. P. Ckll.) ; *C. ribis* Ckll.

DR. C. GORDON HEWITT, Dominion Entomologist, was married at Canning, N. S., on Wednesday, October 11th, to Elizabeth, daughter of Sir Frederick and Lady Borden. Dr. Hewitt's numerous friends in Canada and elsewhere unite in heartiest congratulations and all good wishes for the happiness of himself and his bride.

THE ANNUAL MEETING of the Entomological Society of Ontario will be held at the Agricultural College, Guelph, on Thursday and Friday, November 23rd and 24th. All members and others interested are cordially invited to attend. On the Thursday evening a lecture of a popular character on insects, in connection with the dissemination of disease, will be given by Dr. Riley, Associate Professor of Entomology at Cornell University.

Any members proposing to read papers at the meeting are desired to send in the titles at their earliest convenience to the Secretary, Guelph, Ontario.

BOOK NOTICE.

GUIDE TO THE INSECTS OF CONNECTICUT.—Prepared under the direction of William Everett Britton, Ph.D., State Entomologist and Entomologist of the Connecticut Agricultural Experiment Station. Bulletin 16, Connecticut Geological and Natural History Survey. Part I, General Introduction, by W. E. Britton. Part II, The Euplexoptera and Orthoptera of Connecticut, by Benjamin Hovey Walden, B. Agr., Assistant in Entomology, Connecticut Agricultural Experiment Station.

This is the first of a series of papers on the insects of Connecticut, in which the authors "expect that the entire subject may ultimately be treated."

Part I, comprising the first thirty-eight pages of the report, is a very brief introduction to the study of insects, adapted to the non-entomological reader. Besides a general account of insects, their structure, habits, distribution, economic status, etc., a short bibliography is given of the more important works relating to North American Entomology, and a simple but practical key to the various orders. The arrangement of these in the list which follows is that of Comstock, modified in the Neuropteroid groups by Banks.

A few statements are made that are not strictly accurate, e.g., that tracheal gills persist in the adults of some dragonflies and that the mayflies, which form a very large item in the food-supply of many of our food-fishes, are not important economically.

Part II is an excellent guide to the Euplexoptera and Orthoptera of Connecticut, and contains useful analytical tables and descriptions of the various families, genera and species of these orders known to inhabit Connecticut or adjacent territory. 102 species are described, of which 92 are definitely recorded from within the limits of the State. The nomenclature followed is that which has been in general use for a number of years, and we are glad that the author has not chosen to adopt any of the recent changes through which old and familiar generic names, by a rigid adherence to the laws of priority, have been transferred to other genera, the result being a succession of confusing alterations involving not only generic but sub-family and even family names as well.

The text-figures, of which there are sixty-six, are well chosen, and are, for the most part, copied from the works of Scudder and Morse. There are also eleven half-tone plates from photographs, the first five illustrating Part I and showing typical examples of the various orders and the early stages of a few forms, the remaining six illustrating fifty species of Connecticut Orthoptera and Euplexoptera.

Mailed November 3rd, 1911.

The Canadian Entomologist.

VOL. XLIII.

LONDON, DECEMBER, 1911.

No. 12

FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MILLARVILLE, ALTA.

(Continued from page 369.)

267. [*Euxoa nesilens* Smith.—This appears to be merely a variation of *tristicula* Morr. (No. 275 of this list, q. v.)]

268. *E. ochrogaster* Guen.—In my former notes I tabulated the variations of this species under four headings :

1. Ground colour red. (*Ochrogaster* Guen.)

1a. Ground colour red, with black basal streak, claviform and discoidal cell. (*Gularis* Grt.) Hampson's figure appears to be of the type of *gularis*, a male from "U. S. A.," though the figure is a little too dark.

2. Ground colour ochreous. This is the *Agrotis insignata* described by Walker in his Catalogue, Vol. X, p. 330, 1856. Assuming that the type labels on the specimens in the British Museum are correct, this must not be confused with *Agrotis insignata* described by Walker on page 353 of the same volume, which specimen he described again a year later as *illata*, the latter double type being a specimen of *tessellata*. The two *insignata* have not unnaturally been much confused in literature, and Grote claimed that Walker himself had identified *Hadena suffusca* Morr. with his *illata*, and that the description of *illata*, which I have not seen, might apply thereto. He often called the validity of Walker's types in question, as well he might, knowing that author's slipshod methods. Howsoever, the existing "type" of *Agrotis insignata* Walk., X, 330, 1856, is a badly rubbed, pale, washed out, reddish-ochreous female from Nova Scotia of the species at present under discussion, and is erroneously referred to by Hampson as a prior name to *pleuritica* Grote, the type of which he figures under Walker's name. Prof. Smith makes the correction in Journ. N. Y. Ent. Soc., XV, 143, 1907. He states elsewhere that Morrison's *cinereomacula* is the same form.

2a. Ground colour ochreous, with black markings present. (*Turris* Grt.) The type of *turris* in the British Museum is a female from "U. S.

A," and my note on it is, "pale ochreous, black marked, slightly rufous-banded."

I have not yet seen any real intergrades between the forms above tabulated, though the species is often extremely common in the latter part of the summer, and the larva very destructive as a cutworm in this district. I have, however, no reason for doubting their unity.

Grote twice published a translation of Guenée's description of *ochrogaster*, and in CAN. ENT., XXXIII, 178, points out that it does not seem quite to fit any form of the species we call by that name. Its author compares it with *Noctua plecta*. In addition to the discrepancies pointed out by Grote, I have never seen a red form which had a conspicuously paler collar, though I do not see why such a form might not occur. But if Guenée were really describing what we have been taught to believe, it seems strange that he should have omitted to mention one very striking difference between this form and *plecta*, viz.: the colour of the secondaries, which in *plecta* are usually most conspicuously pearly-white. Sir George Hampson, however, lists a variety of *plecta* from Sweden, *anderssoni* Lampa, with fuscous secondaries, though Staudinger does not mention this character. Neither does Tutt in "British Noctuæ and their Varieties," ii, 126-7, or iv, 118. Guenée's type is in Mr. Oberthür's collection, I think, at Rennes. The species figured by Holland as *ochrogaster* is, as already mentioned, *declarata* Walk.

269. *E. idahoensis* Grt.—I have a Calgary specimen of the grayish form compared with the male type from Idaho in the British Museum. *Furtivus* was described from three females from California. I saw types in the Brooklyn and Washington Museums. One at Brooklyn was labelled "Sierra Nevada." But another type there, and one at Washington were, according to my notes, labelled "Colorado." The locality is mentioned in Smith's Catalogue, though my notes on types may err. The variation was from gray to red, but I thought that all were one species, and the same as *idahoensis* Grote. I think this is probably correct, but do not feel sufficiently sure about it to risk the reference definitely at present. If two species are involved, then the types of *furtivus* may be a mixture. I should not think so were it not that there appear to be two species at Calgary, as I still have two series as I originally diagnosed them, and they do not appear to overlap. In Vol. XXXVII, p. 146, bottom line, after "species," insert "colour red-brown." I may after all be wrong in thinking them distinct, or it may be that my No. 270 is undescribed. Hampson

figures the type of *idahoensis*, but the ground colour is reproduced a little too red, and the costa not gray enough. His figure of *furtivus* is taken from a worn Colorado specimen, determined by Prof. Smith as such, and is almost certainly *idahoensis*. The intervening figure of *fœminalis* is much more like a small specimen of my No. 270. It is taken, however, from a specimen in Prof. Smith's collection, where I saw it, besides others there and at Washington, and it appeared to be a species previously unknown to me.

271. *E. nordica* Smith.—The male type from Calgary is more uniformly gray than the majority of specimens. The female type is less gray. Both are at Washington. Some dark and strongly-marked specimens bear a distinct resemblance to *divergens*, and have the pale median vein of that species, though less contrasting. *Divergens*, however, usually differs in having the costal space more concolorous, but the subcostal vein pale as well as the median, the latter forming a pale V at its junction with vein 3. The s. t. line also is more direct in *divergens*, with less tendency to form a W. *Nordica* at Calgary sometimes has a very decided reddish tint throughout, and the resemblance then may be to my No. 270, which formerly passed as *furtivus*.

Nordica occurs in Manitoba and Saskatchewan. It has been very common during some seasons near Calgary, and is, I think, to be met with every year. I have taken it in some numbers on the Red Deer River, in the district now known as Dorothy. As I before pointed out, the record from "B. C." under the description is erroneous, and the error is copied in Dr. Dyar's and the B. C. lists. I have, however, seen a single specimen, supposed to be of B. C. origin, a male, dated July 11th, 1904, in Mr. A. H. Bush's collection at Vancouver. The specimen was in perfect condition when I saw it, though Mr. Bush was not sure that he had not taken it in a C. P. R. car. It is therefore possible that it may have been a traveller. It was erroneously labelled "*furtivus*." East of the Rockies, the form appears to intergrade with, and is not certainly distinct from *tessellata* and *focinus* (Nos. 263, 264, q. v.). Almost the only evidence I can secure in favour of its distinctness is the absence, with the one exception above mentioned, of *furtivus* from a very large number of *tessellata* and *focinus* which I have seen from Kaslo, Vancouver, and Vancouver Island. There can be no doubt, however, that a certain variation of a species does not always occur throughout its entire range. I may mention here that a considerable number of the *focinus* recorded by Dr. Dyar in

the Kootenai List seem to me unquestionably *tessellata*, as that species is known in the east.

Acutifrons is not certainly distinct from *nordica*. It was described from a male from California, now in the Washington collection, and a female from Oregon, now at Rutgers' College. The former is more like the ordinary form of *nordica* than the latter, from which Hampson's figure of *acutifrons* was probably taken. His figure of *nordica* is poor, that of *islandica* resembling some Calgary specimens very much more closely. The latter specimen is stated in the key to be of an Iceland specimen, but, comparing it with the British Museum series under that name, I found it to be much more like some labelled "*ab rossica*" from Uliassutai Mts., Mongolia.

272. *E. divergens* Walk.—The types of *divergens* and *versipellis* are in the British Museum, and are alike. The former is a male from Nova Scotia; the latter labelled merely "U.S.A.," appears to be a male with female abdomen attached. The ordinary Calgary form is similar. Hampson's figure is of type *divergens*. *Factoris* Smith, was described in 1900 from five females from Glenwood Springs, Colo. The type is in the Washington collection. *Abar* Strecker, was described the previous year from a single female from the same locality. I have seen the type of this in the Field Museum at Chicago, and consider the two names to refer to the same form, the latter of course having preference. It is by no means unlikely that the species is a somewhat obscure form of *divergens*. I have nothing compared with Smith's or Strecker's types, but at any rate *divergens* and *abar* must be closely associated. *Fusimacula* Smith, described in 1891 from a single male from California, in which the reniform merges with the orbicular on the median vein, seems to differ from *abar* in that character only, which is very likely merely varietal. I have specimens which I call *divergens* from Calgary, Kaslo, Glenwood Springs, and Yellowstone Park, in which the reniform runs back, and, as is often the case with such aberrations, not always evenly on both wings.

273. *E. redimacula* Morr.—The form occurring here is that figured by Sir George Hampson from Colorado. Much the same form occurs in the East, and I have a male from New York differing chiefly only in being browner and less grey. But a form occurring much more commonly in the East is more even in colour, has slightly larger and rounder discoidal spots, more even s. t. line without the inward streaks, and paler, dark margined secondaries. So unfamiliar did the form seem to my eye,

that I made sure it was a distinct species. Mr. Winn has taken both forms flying together at St. Hilaire, Quebec, and it was in his material that I first claimed to be able to recognize two species. The majority of the specimens which I saw subsequently in other Eastern collections were of the more even form, and the more I compared, the less able did I seem to draw any line between them. Still, I think the existence of two species quite possible. It would be best determined by breeding. If such is the case, which is Morrison's species will have to be determined by comparison with the type in the Tepper collection at Maddison, Wisconsin.

275. *E. tristicula* Morr.—This species is correctly identified. The type is a male in the Brooklyn Museum. It bears no locality label, but I believe it was described from Maine. Hampson's figure is from a coloured drawing of it. *Nesilens* Smith (No. 267) is evidently a variation of it without the black collar, basal streak, and in the cell. A good picked series of about fifty from Alberta, Manitoba, and a few from Windermere, B. C., show every intergrade between the two. I have examined a very much greater number. In some specimens, the black is replaced by pale ochreous shading. In either form, the costa, median vein, and discoidal spots may be rather distinctly paler than the ground, or quite concolorous. But *nesilens* must sink as an exact synonym of *remota* Smith, female, described from the Sierra Nevada. Prof. Smith agrees with me in this reference. There are two female types in the Henry Edwards collection in the New York Museum, from a figure of one of which Sir George Hampson's has been copied. The shades in the figure are rather too contrasting. The specimens are exactly like some from Calgary. A male type of *remota* is in the Washington collection, and differs from any that I had previously noticed in having the space beyond the terminal line the darkest part of the wing, and lacking all trace of dark shade or dashes before it. I had previously seen a figure of this specimen in the British Museum collection, and expressed a very strong opinion as to its distinctness from the published figure. Examination of the actual specimen showed it to be also a trifle violaceous, and proportionately shorter winged than *nesilens* as I knew it, but on the whole much more like a small specimen of that than I had expected. I subsequently found a Calgary male *nesilens* in Dr. Barnes' collection with the dark termen, and, accepting Prof. Smith's view of the matter, have changed my opinion as to its probable distinctness.

276. *Anytus obscurus* Sm.—In my former notes I expressed my inability to distinguish this from *profundus*, described by the same author from Brandon, Man., on the lower half of the same page. Sir George Hampson, on the strength of one male from Brandon, and two from Calgary, separates them in the table: . . . “Fore wing with the dominant colour fuscous brown—*profunda*,” and “fore wing with the dominant colour black—*obscura*,” altering the gender of the specific name to concord with that of the genus. Prof. Smith publishes a paper on the genus in *Psyche*, XVII, 206-209, Oct., 1910, expressing his views as to their distinctness from each other and from *privatus*, and publishing a plate showing figures of genitalia. He says: “*Obscurus* is really well named, and in the male differs obviously from *profundus* in a distinct brownish tinge, in the lack of contrasts, especially in the s. t. space, in the much more even, powdery suffusion over the whole wing, and in the lack of definition to the median lines.” He states that all the *obscurus*, and no *profundus*, were from Calgary. The decision was based on an examination of 65 specimens of the two forms. The colour differences are at variance with the separation attempted by Hampson, and with the original description, in which a “seal brown tinge” is ascribed to *profundus*, but brown not mentioned at all under *obscurus*. I have 45 specimens from Alberta and Manitoba at present under examination, and have at times studied hundreds more. As a rule, Alberta specimens are darker than those from Manitoba, but by no means constantly so. A brown coloration is variable in either series, and I entirely fail to make a separation by this or any other character or combination of characters. The genitalic differences illustrated by Prof. Smith are, as he himself expresses it, “slight, and perhaps not important,” and I do not now, nor did I ever before, see any reason for believing in the existence of two species. The form will probably eventually prove to be merely a dark, though inconstant variation of *privata* Walk., described from New York, though I should be too arbitrary in making the reference definitely at present. Dr. Dyar, in the Kootenai List, unites the names *obscurus* and *profundus* as a dark variation of *sculpta* (= *privata*), though as a matter of fact, of the three B. C. specimens there referred to, that from Sandon lacks tibial spines, and is not closely allied to these at all.

277. *Fishia* sp.—This species is not *yosemitæ* Grt., of which the type is a California female in the Henry Edwards collection, and which is a prior name to *exhilarata* Smith, described from Pullman, Washington,

and Glenwood Springs, Colorado. I have a specimen compared with the types of both names, and Prof. Smith agrees with me in the reference. *Yosemitæ* is grey, suffused with brown, and strigate with brown and black. No. 277 is usually blue grey, less strigate, and though occasionally tinged with brown throughout, lacks the brown strigations of the other species. It is the "*yosemitæ*" of Holland's figure and stood under that name in the British Museum when I was there, though omitted by mistake from Vol. IV of Hampson's Catalogue. It is also the "*yosemitæ*" of Smith, Trans. Am. Ent. Soc., XXIX, 201, 1903. The two are easily confused, though I believe distinct, and I have seen both from Manitoba and B. C., though as yet no *yosemitæ* from Alberta. I use a manuscript name for it in my own notes, but refrain from describing it until I learn more about some of the closely allied species. *Instruta* Smith, described from four males from De Claire, Man., (Trans. Am. Ent. Soc., XXXVI, 264, Nov. 1910), is evidently a very close relation at best. Another nearly which I feel very uncertain about is *enthea* Grt. *Relicina* Morr., under which name the above species formerly passed, was described from Waco, Texas. The type is stated to be at Cambridge, Mass. Prof. Smith states that it is an ally of *burgessi*. Sir George Hampson describes and figures a Texas female as *Parastichtis relicina*, thus referring it to a genus with unlashd eyes and unarmed tibiæ. *Fishia* has lashd eyes and mid and hind tibiæ spinid, though the spines vary greatly in number and position, being seldom equal on the same pair of legs, and possibly occasionally absent.

(To be continued.)

SOME FURTHER OBSERVATIONS ON THE LIGHT-EMISSION
OF AMERICAN LAMPYRIDÆ: THE PHOTOGENIC
FUNCTION AS A MATING ADAPTATION
IN THE PHOTININI.

BY F. ALEX. McDERMOTT, WASHINGTON, D. C.

In 1910, the writer (CAN. ENT., 1910, Vol. 42, pp. 357-363) called attention to the fact that the female of *Photinus pyralis* Linn.—the species of Lampyrid that is very common within the city limits of Washington, D.C., had been seen to flash following the emission of light by a male flying above her, and also after the sudden flash of an electric light in the room in which the insects had been kept in the dark. Since these observations were made it has been the writer's view that the photogenic function was primarily a secondary sexual character in this species, and that further study would reveal this fact. Accordingly, during the present

year, observations and experiments have been made which leave little doubt that in at least four species in two of the genera, *Lecontea* and *Photinus*, grouped under E. Olivier's sub-family *Photinini*, the photogenic function serves as a mating adaptation.

The first observations were made upon *Photinus pyralis*. It was soon found to be easy to recognize the flash of a female in answer to that of a male flying above her, but it was not so readily determined that her answering flash had any effect upon the actions of the male. The flash of the female, while of the same colour as that of the male, is easily recognized after a little practice, being slower—or rather of longer duration—and less intense. Persistent watch, however, was rewarded by seeing the male drop, following the answering flash of the female, flash again and drop still lower after her second answer, alight a few inches away from her, crawl toward her slowly, flashing at intervals—to each of which flashes she responded—and finally locate and copulate with her. The complete mating process was not followed until after several failures, where the male, after dropping, would rise again, or would simply fail to locate the female definitely, and fly away; but since being observed once, the same entire process has been witnessed a number of times, and under somewhat differing conditions. Apparently the males frequently locate the females by flashing before either has flown, since insects may be taken in copulation before the beginning of the period of flight in the evening. In fact, on one cool, damp evening, when but few insects flew, while the majority crawled to the tops of blades of grass and remained there, flashing at intervals, several instances were witnessed of this mating without flying. But the usual process appears to be as described first—the male flies over the tops of the grasses, weeds, etc., dropping down between them and flashing; any females that come within the range of his flash, answer by their slower flash; if the male sees this answering flash from one, he approaches her, flashes again, to which she answers, and he then finally locates her definitely by means of subsequent flashes. The answering flash of the female does not occur immediately after the flash of the male, but at a period—apparently approximately constant for all females of this species—of about three to four seconds after the flash of the male. This slight delay occurred in every normal case of mating observed with this species, *pyralis*.

To test this matter further, and to see if the females were sensitive to flashes of light in the field, as had been observed in the laboratory, a number of safety matches were ignited at irregular intervals, above an

area of field where there were known to be a number of females of *pyralis*, the match, during the flare of the chemical "head," being swung in an arc in imitation of the dipping flight and flash of the male *pyralis*, and being extinguished as soon as the head burned out. *In each instance the flash of light from the match was followed, within two to five seconds, by the flashes of females of pyralis in the surrounding grass and weeds.* Most of them flashed at the end of about four seconds. They did not flash in the intervals between the lighting of matches, except in response to the flash of a passing male, and in no case did any number answer a male, as they did to a match.

By the use of a small electric bulb, connected to a battery and push-button a few feet away, it was found quite as easy to deceive the male *pyralis*; the bulb is placed so that most of the light is thrown downward by the back of the lamp, and the circuit kept open until a male flashes within about two or three feet of the lamp. Then after a pause of three to five seconds, the circuit is closed through the push-button, so as to imitate as nearly as possible the answering flash of the female. If the male is in a position to see the light of the bulb, he will almost invariably drop, and repeating the process will bring him up to the bulb; usually he will crawl around and over it excitedly, for a few minutes, and then fly away. Sometimes males would crawl up grass-stems above the bulb, and apparently looking over the edge of the blade, hold perfectly still for a moment, and then flash; the instant the bulb was flashed in answer they would commence to wave their antennæ rapidly, and crawl quickly down the blade and toward the bulb. Early in the flying period of an evening, as many as a dozen males have been thus attracted in a few moments. Flashing the electric light bulb immediately after the flash of the male, without the pause of a few seconds, was observed to be less effective in attracting them, though some would still come to the bulb when operated thus. The same apparatus may be used to excite the answering flash of the females, when the bulb is waved in an arc during the closing of the circuit.

One or two facts regarding this species—and to some extent they apply to many other Lampyrids—are of interest in this connection. The light of the males in flight is directed by the position during flight and by the reflecting layer of the photogenic organ, for the most part forward and downward; the eyes of the male are much larger than those of the female; the flash of the female is of such a character, and the organ so

placed, as to give the male a brief silhouette of the female as she rests on a blade of grass or a leaf.

During and immediately after copulation, the females of *pyralis* will not respond to the flash of a passing male, or to the flare of a match. A few females will be found that will not respond to a match; these are probably those that are completely impregnated; some, although apparently fresh, will respond only feebly, or irregularly; occasionally males will be found that will flash in response to the light of a match, though only rarely. No definite instance has been observed of a flying male mistaking the flash of a creeping male for that of a female, and dropping to it. Observations on a single female of *pyralis*, which it has regrettably been impossible as yet to confirm by further trial, showed that she would not respond to the flash of a female *Photuris pennsylvanica* Deg., made to flash above her, nor to a male of *Photinus consanguineus* Lec., although the same female readily responded to a match.

In copulation, the female raises the tip of her abdomen toward the male, the latter being mounted upon her back in such a position that the end of his abdomen is slightly farther back than hers. The insects remain coupled for anywhere from half a minute to several hours. One female has been noticed in captivity to couple with several males successively, but a similar observation in the field has not been made. The males certainly do not die within a week after copulation, though definite evidence that they mate a second time, or more often, has not been obtained.

For the most part the observations recorded above for *Photinus pyralis* have been exactly repeated for *Photinus consanguineus* and for *Photinus scintillans* Say. In each of these species the male has been seen to flash above a patch of grass, the female flash her answer from her resting place in the grass, the male drop, locate her through subsequent flashes, and finally couple. There are slight differences of application, due to the fact that the female of *scintillans* is apterous, while the female of *consanguineus* is, if anything, more active than that of *pyralis*, being noticed several times in the lower branches of small trees. Another difference is that the female of *consanguineus* will practically never answer the flare of a match by flashing, and the female of *scintillans* will do so but rarely. It will be remembered that the characteristic flash of the male *consanguineus* is two sharp fulminations, separated by a slight interval, while that of *scintillans* is very much shorter and sharper than that of *pyralis*, and also rather more orange; neither of these flashes can

be successfully imitated with a match. With an electric flash-light, however, it was found very easy to excite the answering flash from the female *scintillans*; equally good results were not obtained with the female *consanguineus*, however; the latter would answer the double flash of the electric light while some twenty or thirty feet away, but upon close approach they seemed to recognize the difference, and ceased to answer. The females of both these latter species answer the male's flash much sooner than does *pyralis*—usually within one second from the flash of the male. The flash of the female *consanguineus* is much like that of the female *pyralis*, being a single slow flash; the flash of the female *scintillans* is also a single slow flash, but is shorter than that of *pyralis* or *consanguineus*, though perceptibly of longer duration than that of male *scintillans*. *Scintillans* female responds to the flash of male *consanguineus*, flying above her, but the latter appears to pay no attention to her; she responds after the first flash of the *consanguineus* ♂, while *consanguineus* ♀ does not respond until after the second flash of her mate.

Although no definite experiments have been performed, it must be remarked here that neither *consanguineus* ♀ nor *scintillans* ♀ has been observed to respond to the flash of *Photuris*, although the latter insect has been observed a number of times to flash while over regions where the two former females were known to be.

Very similar observations were made upon *Lecontea lucifera* Melsh., the greenish, twinkling light of the male flying over the grass being answered by the slow single glow of the female clinging to the grass beneath. Only rarely were the males observed to drop, and actual mating was not witnessed, but from the fact of the female's answering flash, there remains but little doubt as to the nature of the process. Unfortunately the season of maximum prevalence of this species here was over before tests were made as to their sensitiveness to other lights than that of the male insect, so nothing can be said on this point.

Although a quite close watch has been kept on *Photuris pennsylvanica* Deg. for a considerable number of nights, nothing definite can be said as to the possible relation of its light emission to its reproductive life. A large number of these insects fly about in the trees and bushes, emitting their light in the various ways that have been described for it, and yet apparently paying no attention to each other. Dr. W. W. Coblentz informed the writer that the larger number of this species that he caught were females; this is certainly not the usual case with the other species mentioned, or with Lampyrids generally. In this species both sexes are

about equally active, and powerful flyers; the male has slightly the larger luminous apparatus of the two, and somewhat larger eyes. No connection between the different modes of light-emission of this species and the two sexes could be made out.

Two random observations: Those males of *Photinus pyralis* which seemed strongest and most active, were frequently noticed to have the ventral surface of the luminous segments of a pale salmon-pink colour, instead of the usual sulphur-yellow; the assumption is that these were newly-emerged insects, and that this salmon-pink is the initial colour of the photogenic organ, and that after use the usual sulphur-yellow colour appears. The colour of the light appears to be exactly like that of the insects with the yellow surfaces to these segments. Whether this change denotes a using-up of the photogenic material is an interesting problem, but one that would be difficult to solve. Second: One specimen of *Photinus scintillans* ♀ was observed in which the rudimentary elytra were at least one-half longer, proportionately, than is usual in this insect, perhaps representing a tendency to a dimorphic female in this species.

It may be objected that the proof submitted here is not sufficiently convincing as to the primarily sexual relation of the photogenic function. Perhaps it is not; there are various hypothetical questions that might be raised regarding it. But the writer believes that if anyone will take the trouble to observe some of these three species, or any of their near relatives, they will doubtless come to the same ultimate conclusion—that the light, as actually used by the insects, is primarily for the purpose of sexual attraction, and that the reproduction and continuance of the species depends upon it.

A brief review of what literature there is on this subject may be of some interest here.

There has been considerable difference of opinion in times past as to the precise purpose of the luminosity of the Lampyridæ, some holding it to be a secondary sexual character, others claiming that it is purely defensive in nature, and still others declaring that neither of these explanations satisfied the conditions, and that the luminosity plays some part in the life of the insects of which we had no knowledge. There seems to have been really surprisingly little actual observation one way or the other. A diligent search of the references given in the "Zoological Record" since its foundation yielded but few papers dealing with this question—itsself obviously one of fundamental biologic importance—and those found for the most

part were purely speculative. Jenner, in his note on *Phosphænus hemipterus* Fourcroy (Entomologist, 1883, Vol. 16, p. 216), regards the photogenic function in this insect as purely protective, and although there have been a number of papers published on this odd little Lampyrid, nothing very definite seems to have been adduced as to the usefulness of its luminosity. Incidentally, the observation cited by Planet (Le Naturaliste, 1908, Vol. 31, p. 200), of the finding of a *Phosphænus* ♀ in copula with a small specimen of *Lampyris noctiluca* ♂ is of considerable interest in this connection.

Emery's observations on *Luciola italica* Linn. (Bull. Soc. Entomol. Ital., 1887, 18, p. 406; Stett. Entomol. Ztg., 1887, Vol. 48, pp. 201-206), certainly seem to support the view taken by this author of the sexual character of the photogenic function in this species. The relation between the photogenicity and the sexual life in *Lampyris noctiluca* Linn. seems to have been recognized for over a century, since Spallanzani (Chimico esame sopra la luce del fosforo, etc., Modena, 1796, p. 129), records it apparently as a matter of general knowledge that if a "luccio-lone" were exposed by night, a winged "lucciole" would come to and couple with it. ("Luccio-lone" is a popular word signifying the glow-worm, or female of *Lampyris noctiluca*, while the word "lucciole" is usually applied to either sex of *Luciola italica*, though in this connection it evidently refers to the male of the *Lampyris noctiluca*). The same observation was repeated by Phipson (Phosphorescence, London, 1868, p. 142). Quite recently Folsom (Entomology, with reference to its biologic and economic aspects; Philadelphia, 1906, p. 132), has stated that he regards the photogenic function in *Photinus* as a sexual character.

Gorham's paper on the "Structure of the Lampyridæ with reference to their phosphorescence" (Trans. Entomol. Soc. Lon., 1880, pp. 63-67), although mainly speculative, is of interest and importance in this connection. Under the head of "Biologische (ökologische) Bedeutung der Lichtproduktion," Mangold, in his monograph "Die Produktion von Licht" (Hans Winterstein's Handbuch der vergleichenden Physiologie, Vol. III, 2nd Half, pp. 326-332; Jena, 1910), has given a very extensive review of the present status of our knowledge of the usefulness of the photogenic function in luminous organisms in general.

There are but few references in the literature to the attraction of Lampyridæ to artificial lights. Lord Avesbury (The Origin and Metamorphoses of Insects, London, 1873, p. 17), notes that the male of *Lampyris noctiluca* will occasionally fly into rooms, attracted by light, which it apparently mistakes for that of its mate.

Dr. E. J. Lund (Johns Hopkins University Circular, 1911, NS, No. 2, pp. 10-14), has observed that of the Lampyrids of Jamaica, only *Photinus pallens* Browne showed any decided positive reaction to light stimuli, and in this case the reaction was very slight, whereas the Elaterid fire-fly of the same island, *Pyrophorus plagiophthalmus* Germar, was strongly attracted to light.

In the writer's experience, a single specimen of the male of *Lecontea lucifera* has been observed to exhibit attraction toward light, but the species of *Photinus* seem, for the most part, to be quite devoid of this property. Both the males and females of *Photuris pennsylvanica* have, however, been known to come to light, and several instances of this have come under the writer's observation.

Since the foregoing paper was written, Mr. Frederick Knab, of the U. S. National Museum, has called the writer's attention to a brief note by Osten-Sacken (Die Amerikanischen Leuchtkäfer, Stett. Entomol. Zeitg., 1861, Vol. 22, pp. 54-55), in which are recorded observations upon *Photinus pyralis*, made here in Washington, and which are practically identical with those given herein for the normal conduct of this insect. Hence the writer's observations on *pyralis* can be considered only as confirmation of the earlier observations of Osten-Sacken; in view of the fact, however, that Osten-Sacken's paper appears to be very little known, and has been overlooked by the majority of those who have contributed to this subject, it seems justifiable to leave the paper in its present form, making this acknowledgment of the previous work.

The assistance and criticism of Mr. H. S. Barber, of the National Museum, is also acknowledged with pleasure.

SECOND INTERNATIONAL CONGRESS OF ENTOMOLOGY.

The Second International Congress of Entomology will be held at Oxford, England, from August 12th to 17th, 1912. Further particulars will be announced shortly.

The Executive Committee proposes to find for members of the Congress lodgings in the town, or rooms in one or more of the colleges at a moderate charge; rooms in the college will be available only for men.

The Executive Committee invites an early provisional notice of intention to join the Congress, in order to be able to make the arrangements for the necessary accommodation.

The proceedings of the First Congress are in the press, and will be published shortly.

All communications should be addressed to the General Secretary of the Executive Committee, Malcolm Burr, care of the Entomological Society of London, 11 Chandos St., Cavendish Square, London, W., England.

HENRY SKINNER,

Member Permanent Exec. Committee representing America.

MISCELLANEOUS NOTES ON THE HYMENOPTERA CHALCIDOIDEA: THE GENUS *ARTHROLYTUS* THOMSON;
HORISMENUS MICROGASTER ASHMEAD.

BY A. ARSENE GIRAULT, BRISBANE, AUSTRALIA.

(Continued from page 377.)

Family Eulophidae.

Subfamily Entedoninae.

Tribe Entedonini.

Genus *Horismenus* Walker.

1. *Horismenus microgaster* (Ashmead).

Holcopelte microgaster Ashmead, CANADIAN ENT., 1888, XX, p. 102,
Idem.—De Dalla Torre, 1898, p. 28.

Horismenus microgaster (Ashmead).—Schmiedeknecht, 1909, p. 433.

Pediobioidea cynea Girault MS.—Webster, 1909, pp. 207, 209-210.

Unfortunately, I identified this species recently (Webster, l.c.) as a new genus and species, giving it the MS. name *Pediobioidea cynea*. However, the mistake was discovered before publication of the description, so that the name is a *nomen nudum*. The species is poorly described, so that I redescribe it herewith and designate a type from the original specimen.

Normal position. *Male*. — Head triangular (cephalic aspect), slightly wider than long and wider than the thorax, the face reticulated, impressed along each side of the meson (the scrobes), the malar space large, smooth. Eyes oval, on the lateral aspect; ocelli in a triangle on the vertex, the lateral ones about their width from the eye-margin and near to the rounded or obtuse occipital margin; head (dorsal aspect) about $2\frac{1}{4}$ times wider than long; antennae inserted below the middle of the face, but above (dorsad) of an imaginary line drawn between the ventral ends of the eyes, rather short, in both sexes 8 jointed, with a ring-joint, the club single and acuminate at extremity. the funicle 4-jointed, the apical three joints moniliform, and the flagellum (excluding pedicel) clothed with rather long, soft, dense, whitish hairs. Head, pronotum and dorsum of the mesothorax delicately, squamosely reticulated, the metathorax glabrous and prolonged caudad into a short truncate neck (dorsal, lateral aspects); metathoracic spiracle minute, margined and oval. Abdomen distinctly petiolate, smooth, oval, the second segment occupying most of the dorsal surface, the others

retracted into it; abdomen about as long as the length of the thorax. Parapsidal furrows incomplete, but distinct caudad, leading from a point just cephalad of the cephalo-mesal angle of the axillæ and distinct for a third the length of the mesoscutum, narrow, like the median furrow of the scutellum. Scutellum with a distinct median and a lateral longitudinal furrow, the latter complete and punctate for its entire length (see female); caudal margin of the mesoscutum, between the axillæ, slightly emarginate, just on each side of the meson; otherwise that portion of it is straight. Postscutellum rugose basally, triangularly peltate; median line of the metanotum smooth and broad, differentiated, oval. Ring-joint present, very shallow, in effect a broad median carina bordered by a sulcus on each side. Legs normal, coxæ enlarged, somewhat globular, the tarsi 4-jointed. Wings hyaline, densely, shortly ciliate distally, the marginal cilia moderate, short, the stigmal vein distinct, but very short, subessile, as is also the postmarginal vein, both subequal and about a sixth or seventh of the length of the marginal vein, which in turn is about one-third longer than the submarginal vein. Mandibles acutely bidentate, the inner or mesal tooth slightly shorter, and with its apical margin serrate at its middle. Body small and delicate, metallic.

From 6 specimens, $\frac{2}{3}$ -inch objective, 2-inch optic. Bausch and Lomb.

Female.—As the male. Head densely, minutely reticulated on the face, laterad of the scrobes and also on the vertex and occiput, finely, minutely, longitudinally rugulose just beneath the eyes, the malar space or genæ smooth, the eyes shorter, more rounded and more convex; antennæ inserted slightly below (ventrad of) an imaginary line drawn between the ventral ends of the eyes, without a ring-joint, but the club 2-jointed, the apical joint small and conical, the funicle 3-jointed, its joints subpedunculate; the flagellum somewhat less hairy than in the male. Petiole of abdomen stouter and less conspicuous, but distinct. Axillæ widely separated. The lateral longitudinal furrow of the scutellum complete and uniform, not evanescent caudad, and continued caudo-mesad in a curved line to the base or origin of the median furrow (caudal end), and consisting of shallow oval punctures; the median grooved line narrow. Abdomen long, pointed, conic-ovate, but very slightly produced convexly ventrad, and inclined dorsad from its insertion (dead specimen), hiding the petiole somewhat, the second (first body) segment very long, somewhat over a half the length of the abdomen (excluding the petiole), and hence longer

than the combined lengths of the following segments ; segments 3 and 4 subequal ; segments 5 and 6 subequal and about one-half longer than 3 or 4 ; segment 7 apparently twice, or nearly, the length of 5 or 6, narrowing caudad, and the 8th segment much narrower, conic, but nearly as long as segment 7 ; abdomen longer than head and thorax combined, but not much longer ; sheaths of the ovipositor not exerted or prominent. Body moderately stout, the thorax long, abdomen stout and pointed ; metallic. Metanotum smooth, the median line as in the male, on each side of it a longitudinal roughened impression, and a deep reticulated impression running cephalo-laterad from the side of the neck, along the margin to about a point near the insertion of the caudal coxæ. Meso-pleura smooth, excepting those of the mesoscutum and prothorax. Base of the meso-postscutellum impressed and rugose, the sclerite peltate, its cephalic margin straight, the lateral margins obliqued caudo-mesad, margined, shining, acute at the meson. Caudal coxæ twice the size of the intermediate ones. Tarsi 4-jointed, the apical joints long. Ovipositor not exerted.

Female.—Length, 1.56 mm.

General colour metallic dark cyaneous (dark indigo, or French, blue), the abdomen darker, with a brassy sheen and purplish reflections ; eyes purple-lake, clothed with short stiff hairs, the ocelli ruby-red ; knees, tibiæ and tarsi white, with the exception of some brownish on the outer (dorsal) aspect of the tibiæ near the base and the brownish-black apical tarsal joints ; trochanters pallid ; tegulæ concolorous. Wings hyaline, the venation pallid-yellow ; antennæ shining black, metallic bluish-black in bright lights.

Sculpture of the mesoscutellum less dense than that of the mesoscutum and different in appearance, but of the same general character ; coxæ glabrous, brilliantly polished. Petiole, or first abdominal segment, concolorous with the abdomen, rugose, as long as the caudal coxæ, cylindrical and moderately stout ; discal cilia of fore wings, proximad, moderately long, longer than those apicad, the apex of the wing broadly, oblato-convexly rounded ; lateral ocelli farther apart than each is from the cephalic ocellus ; mesoscutum and the caudal margin of the pronotum with several long, slender, stiff, white hairs, one of which arises from a setigerous puncture near the base of the incomplete parapsidal furrows ; head with similar, but much shorter and more numerous, hairs, and the scutellum with several of the long ones, one arising from the lateral

grooved line, caudad; stigmal vein with a nipple-like projection just before the apex (=uncus).

Scape of the antennæ about as long as the combined length of the pedicel and the two following joints, slightly dilated ventrad at its middle, cylindrical; pedicel obconical, about three-fourths the length of the first funicle joint and not as wide; joint 1 of funicle rectangular, narrower, but one-fourth longer than funicle joint 2, which is about equal in length to the pedicel and subquadrate, but longer than wide and somewhat larger than funicle joint 3; the latter shorter and quadrate, distinctly smaller than the basal club joint, its peduncle subobsolete; funicle joints 1 and 2 with a short stout peduncle on one side of the apex, the opposite apical margin inclining obliquely to it; club about as long as the pedicel and second funicle joint united, about, or less than, half the length of the funicle, the proximal joint subequal to funicle joint 1, more than twice the size of the apical joint, which is smaller than the pedicel and regularly conical and acute at apex. Antennæ hispid-pubescent with white hairs, which arise from tuberculate spots, making the funicular and club joints rough. Antennæ cylindrical.

From one specimen, $\frac{2}{3}$ -inch objective, 2-inch optic. Bausch and Lomb.

Male.—Length, 1.20 mm. The same.

Body less robust, smaller, the abdomen regularly ovate, the second abdominal segment large, as in the female, and widest, the others somewhat retracted into it; genitalia exerted in death, the body of the abdomen not as long as the thorax, about as long when including the petiole; the latter slenderer and more distinct, its sculpture slightly more delicate. Eyes slightly larger, the cheeks, therefore, not as long as in the female.

Pubescence of funicle and club more pilose in appearance, softer. The antennæ differ as described in foregoing; scape slightly shorter, not quite equal to the combined lengths of the three following joints; pedicel about the same; first funicle joint and the club longest of the flagellum, subequal, the club larger, a third longer than joints 2, 3 and 4 of the funicle, all of which are subequal and quadrate; the second funicle joint a little irregular; peduncles of the funicle joints about as in the female, but that of the 4th joint longer in the male than that of the 3rd funicle joint in the female and more mesad; club joint ending in an acute spine-like projection; club equal to less than a half of the length of the funicle. Antennæ filiform as a whole.

From six specimens, $\frac{2}{3}$ -inch objective, 2-inch optic. Bausch and Lomb.

Redescribed from six male and one female specimens, tag-mounted, received for identification from Mr. R. L. Webster, Iowa State Agricultural Experiment Station, Ames, Iowa, the specimens bearing the following labels: "Exp. 205, 2 August, 1908," 2 males; "Exp. 217, 2 and 3 August, 1908," 2 males; "Exp. 322, 11 Nov., 1908," 1 female; and "Exp. 322, 17 and 19 Nov., 1908," 2 males. Reared from the larvæ of the Yellow-head Cranberry worm (*Alceris*) *Peronea minuta* (Robinson), but the degree of the parasitism is most probably secondary, the host of the parasite being *Clinocentrus americanus* Weed.

Habitat.—Missouri (St. Louis); Iowa (Des Moines and Shenandoah); Illinois (Normal, Champaign).

Type.—Type No. 12,205, United States National Museum, Washington, D. C., one male, tag-mounted (Missouri, the original specimen).

This species is evidently a secondary parasite; in the collections of the Illinois State Laboratory of Natural History are specimens reared from the larva of *Canarsia hammondi* Riley at Champaign, Ill., July 10 and 14, 1895, W. G. Johnson (accession Nos. 21,376 and 21,377); also specimens recorded as a secondary parasite of the same host, the same locality, September 6, 1894 (Nos. 21,031; 21,032).

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Description of *Dipochys boucheanus* (Ratzburg) as *Cleonymus clisiocampæ*, n. sp.

1871. Riley, Charles Valentine.—Third annual report on the noxious, beneficial and other insects of the State of Missouri, made to the, etc., Jefferson City, p. 120.

1882. Möller, Gustaf Fredrik.—Novæ Hymenopterorum species descriptæ. Entomologisk Tidskrift pa, etc., Stockholm, tredje argangen (III), p. 180.

1883. Sandahl, Oskar Theodor.—Ibid., fjärde argangen (IV), 124, 223.

1886. Howard, Leland Ossian.—A generic synopsis of the hymenopterous family Chalcididae (continued). *Entomologica americana*, Brooklyn, II, pp. 38, 97.

1887. Cresson, Ezra Townsend.—Synopsis of the families and genera of the Hymenoptera of America, north of Mexico, together with a catalogue of the described species and bibliography. *Transactions, American Entomological Society*, Philadelphia, supplementary volume, 1887, pp. 77, 138.

1893. Ashmead, William Harris.—Bull. Nos. 3, 1, technical series, Ohio Agric. Exp. Station, Norwalk, Ohio, p. 162.

Original description of *Arthrolytus apatelæ* Ashmead.

1894. Webster, Francis Marion.—Notes on some species of Ohio Hymenoptera and Diptera heretofore undescribed. Bull. Nos. 3, 1, technical series, Ohio Agric. Exp. Station, Norwalk, Ohio, p. 158.

Arthrolytus apatelæ.

I found, on September 10th, a specimen of this species under the body host, which had in this case evidently been killed by *Rhogas intermedius* Cress. It does not appear to be abundant.

1894. Ashmead, William Harris.—Descriptions of new parasitic Hymenoptera. *Trans. American Entomological Society*, Philadelphia, XXI.

1897. Howard, Leland Ossian.—A study in insect parasitism, etc. Bull. No. 5, technical series, Division of Entomology, U. S. Dep. Agric., Washington, D. C., p. 36.

1898. De Dalla Torre, Carl G.—*Catalogus hymenopterorum hujusque descriptorum systematicus et synonymicus*, Lipsiæ, p. 155.

Arthrolytus: *albiscapus*, *apatelæ*, *pimplæ*, *punctatus*, *puncticollis* and *rugifrons*.

1903. Fiske, William F.—A study of the parasites of the American Tent Caterpillar. Technical Bull. No. 6, New Hampshire College Agric. Exp. Station, Durham, pp. 224-225.

1904. Ashmead, William Harris.—Classification of the Chalcid Flies or the superfamily Chalcidoidea, with, etc. *Memoir of the Carnegie Museum*, Pittsburgh, I, No. 4 (Publications of the Carnegie Museum, serial No. 21), pp. 320, 322, 367.

1906. Nason, William A.—Parasitic hymenoptera of Algonquin, Illinois, IV. *Entomological News*, Philadelphia, XVII, p. 153.

1907. Mesi, Luigi.—Contribuzioni alla conoscenza dei calcididi Italiani, Portici (Estratto dal Bollettino del Laboratorio di Zoologia

generale e agraria della R. Scuola Superiore d' Agricoltura di Portici, I, 29 Novembre, 1907), pp. 252-254, figs. 13, 14A, B, 15, 16.

1907. Schmiedeknecht, Otto.—Die Hymenopteren Mitteleuropas nach ihren, *etc.*, Jena.

1909. Idem.—Genera insectorum (dirigés par P. Wytsman), Bruxelles, 97 *me* fascicule.

1909. Webster, R. L.—Bull. No. 102, Experiment Station, Iowa State College of Agriculture and Mechanic Arts, Ames, pp. 208-209.

NOTES ON TWO CONOCEPHALIDS.

BY WM. T. DAVIS, NEW BRIGHTON, STATEN ISLAND, NEW YORK.

The grasshopper, *Conocephalus caudellianus*, was described in the CANADIAN ENTOMOLOGIST for August, 1905, from several males found at Lakehurst, N. J., in Sept., 1903. Since that time additional specimens have been collected in New Jersey at Lakehurst, Tuckerton and Jamesburg. We, however, failed to find any females on these occasions, and it was not until August, 1910, while at Cold Springs, Cape May Co., N. J., that two female *caudellianus* were found in the meadow along Bradley's Run. The ovipositor is 33 mm. in length, and comes even with the end of the elytra. The hind femora are 28 mm. long. The fastigium in shape and markings is like that of the males described as above cited.

The *caudellianus* found at Tuckerton in September, 1907, were in a rather dry field, and some of them, when disturbed, flew away to long distances. Two flew several hundred feet and lit in cedar trees that bordered the field. This is an unusual proceeding, for they generally seek safety by dropping to the ground and hiding among the thick vegetation.

In the Proceedings of the Entomological Society of Washington, Vol. XII, p. 121, 1910, Mr. H. A. Allard compares the stridulations of *Conocephalus exiliscanoris* Davis and *C. bruneri* Blatchley. Since describing *exiliscanoris* in 1886, I have collected a great many specimens, and find that the song varies considerably in loudness, according to the age of the singer. Its volume is also dependent on temperature to some extent. Furthermore, the insect gradually decreases in size as one travels north, those from Cape May Co., N. J., being much larger than Long Island specimens. From these facts I am inclined to think that *bruneri* is a synonym of *exiliscanoris*, as has been suggested.

A NEW SPECIES OF DEROSTENUS (CHALCIDOIDEA).

BY C. R. CROSBY, ITHACA, N. Y.

Derostenus salutaris, new species.—Male. Length, 1.5 mm. Head, thorax and abdomen bright metallic green, the last darker and bluish in certain lights. Head viewed from above strongly convergent behind the eyes and strongly concave posteriorly; the occiput bounded by a distinct ridge bearing a row of blackish hairs. Viewed from in front the inner margin of the eyes sinuate. Antennæ inserted near the mouth and separated by a distinct median carina. Head finely shingled and clothed with sparse, short, dark-coloured hairs. Eyes finely pubescent.

Thorax more distinctly shingled and clothed with a few rather long brownish hairs. Propodeum with a median carina and a transverse carina before the apex; no lateral carinæ present.

Antennæ dark, nearly black; scape white; ring-joint distinct; funicle of three nearly equal segments; club ovate, of three closely united segments, the last small and style-like; flagellum filiform. Legs white; coxæ metallic green. Wings hyaline; postmarginal vein about as long as the stigmal.

Petiole of abdomen a little longer than hind coxæ, finely and densely punctate. Abdomen viewed from above nearly circular, smooth and flattened. The first segment behind petiole about one-third the length of abdomen, the others subequal.

Described from two ♂ specimens reared 2nd June, 1911, from cocoons of the plum leaf-miner (*Nepticula slingerlandella* Kearfott), from Rochester, N. Y.

The larva is 1.4 mm. long, smooth, whitish in colour, and rounded at both ends. The mandibles are very small and inconspicuous.

Mr. Heath's note on *Pieris protodice*, in the September number (p. 327), records just such an experience as I myself had this summer. On July 25, while hunting in my own grounds, I perceived a white butterfly which seemed to be different from the cabbage butterflies that were flying about. I netted it, and found it to be *P. protodice*—the first I had ever seen in this neighbourhood, where I have been collecting since 1907. On Aug. 21, in some pasture-fields near this town, I found numbers of *protodice* mingling with the crowds of *rapæ*. I at once captured two, male and female, and could have taken a dozen with ease.—FRANK M. GIBSON, PH.D., Westminster, Maryland, 12th September, 1911.

FURTHER NOTES ON DIABROTICA.

No. II.

BY FRED. C. BOWDITCH, BROOKLINE, MASS.

D. alternata, nov. sp. (Jac. in litt).

Head and middle joints of antennæ black, thorax flavous, transverse, constricted behind, and bifoveate, scutel black, elytra bright bluish green, transversely, rugosely, coarsely punctate with about five elevated costæ, lateral margin and apex flavous, beneath and legs flavous, tibiæ and tarsi fuscous. ♂ with a hollow and protuberance near the sutural apex. Length, 6 mm.

Callanga, Peru, 2 ♂, 1 ♀, 1 ♀?

Very near *viridipennis* Jac. (type in my collection). The main difference aside from a little brighter colour, is the wholly black head in the ♂. The species has been distributed with the manuscript name *alternata* Jac. of the pair sent to me as co-types by Messrs. Staudinger & Bang-Haas, the ♀ seems to be probably a different species, the lower part of the face being yellow, the antennæ wholly fuscous testaceous and parts of the body beneath black.

Head smooth, with a fovea, palpi flavous, antennæ more than half the length of the body, black, first joint testaceous, 2nd testaceous below, 8-9 and part of 10 flavous, thorax transverse very narrow, moderately coarsely punctate (like *viridipennis*, though Mr. Jacoby's description says the reverse), elytra moderately widened behind with about 5 distinctly elevated costæ which vanish at or before reaching the testaceous tip, which is broad with a deep sutural excavation similar to that of other species of this group (C. Baly's paper). The legs are fuscous on the upper outsides.

D. nigrotibialis, nov. sp. (Jac. in litt).

Head black, mouth parts yellow, antennæ black with last three joints pallid, thorax transverse, flavous, deeply depressed, trifoveate, the depression more or less piceous, scutel smooth black, elytra black, elongate, nearly parallel, thickly, coarsely, corrugately punctate, black, the lateral margin narrowly flavous, the ♂ with cariniform process on the convexity near the suture, below and legs flavous, tibiæ and tarsi black. Length, 7-8 mm.

Eight examples, Marcapata, Peru.

December, 1911

The antennæ are about $\frac{3}{4}$ the length of the body, the second joint short, the third more than twice as long, the fourth barely longer than the two preceding. The thorax is nearly twice as wide as long, the surface shiny and finely punctate, the depression very deep and extending nearly from side to side, sinuation of the sides short and well marked, the punctuation of the elytra coarse, confluent and granulate between the punctures, becoming obsolete at extreme tip. The cariniform tubercle places this species in Baly-Gahan, section 2, division C, near *ambitiosa* Er.

This species has been distributed with the manuscript name *nigrotibialis* Jac. A pair of co-types has been sent me by Messrs. Staudinger & Bang-Haas. Other examples are in my collection. The ♀ co-type has the elytra cyaneous blue instead of black; my other two ♀'s are black.

D. pallens, nov. sp.

Head black, antennæ $\frac{2}{3}$ length of body, black, base of the first joint and last three joints (apex of the eleventh excepted) pale. Thorax pale yellow, transverse, depressed, punctured, trifoveate, scutellum black, elytra pale yellow, smooth, shining, sparsely and finely punctulate, with two transverse depressions at and behind the middle respectively, suture just back of the scutellum, very narrowly piceous, beneath yellow, inclined to piceous, legs yellow, tibiae and tarsi black. Length, $7\frac{1}{2}$ mm.

One (♂?) Carrillo (type), 2 (♀?) San Carlos, Costa Rica; coll. Schild-Burgdorf.

The two San Carlos examples differ from the type in that the 7th and 8th joints of the antennæ are more or less flavous. The type has the 8th joint lighter at the apex than the base, joint 2 short, 3 twice as long, 4 a trifle longer than the two preceding. In the ♀ the third joint is obviously longer than twice the second.

The thorax is twice as broad as long, strongly sinuate and broadly margined at the sides behind; there is an obsolete median third fovea visible between the two side ones; the nearly parallel elytra have a well-marked humeral groove, making the shoulder prominent, and a broad, smooth elevation near the suture making a well-marked sutural depression; the median depression is deeper than the rear one, but both are easily visible with the naked eye; the rear one gives the appearance of a broad, smooth elevation on the convexity. Near *subimpressa* Jac., from Costa Rica.

D. contrastigma, nov. sp.

Head black, mouth parts flavous, antennæ a trifle over half the length of the body, black with the under side of the first few joints flavous, thorax flavous, transverse, depressed, bifoveate, scutel black, elytra nearly parallel, not plicate, flavous, transversely depressed at the middle, a common sutural wedge-shaped piceous spot reaching to this depression, and the suture very narrowly lined with black nearly to apex. There is also a supplemental depression running from the shoulder obliquely towards the median depression body. Beneath piceous, thorax flavous, legs flavous, tibiæ and tarsi piceous. Length, 6 mm.

One example, San Carlos, Costa Rica ; coll. Schild-Burgdorf.

Joint 2 of the antennæ is short, 3 more than twice as long, 4 shorter than the preceding two ; the thorax is nearly twice as wide as long, strongly sinuate at the sides behind ; the elytra are smooth, sparsely and finely punctuate ; the humeral umbone is prolonged into a sort of obsolete ridge, which vanishes behind and gives the elytra a flat back in front, with strongly declivous sides.

Has the general appearance of a small, ill-developed *suturalis* Baly, with the usual large rear black spot absent.

D. castanea, nov. sp.

Head rufous, piceous about the eyes and mouth parts ; antennæ about the length of the body, black, rufous at the base ; thorax rufous, transverse, depressed, strongly bifoveate, scutel rufous piceous, elytra nearly parallel, flavous, with a post median sutural, elongate rufous spot, on each side, and a strong transverse median depression ; surface finely and sparsely punctulate ; body below piceous, thorax rufous, legs yellow, with black tibiæ and tarsi. Length, 6½ mm.

One example, San Carlos, Costa Rica ; coll. Schild-Burgdorf.

Antennæ with joint 2 short, 3 more than twice its length, 4 shorter than the preceding two, thorax much broader than long, very markedly sinuate at the sides behind, elytra strongly depressed around the scutel and with a well-marked humeral depression running from just inside the shoulder knob, obliquely towards the median depression.

I place the species near *subimpressa* Jac., from Costa Rica.

(To be continued.)

PERILLUS CLAUDUS A BENEFICIAL INSECT.

In the September number of this magazine appeared a note by Dr. Bethune relative to the predaceous work of *Perillus claudus* Say on the Colorado potato beetle. I also am glad to report the good work of this insect in Michigan during the years 1908 and 1909. In 1908 it was sent in to the Michigan Agricultural College several times, and each time mentioned as killing the potato beetle. In 1909 it was sent in quite frequently, and from many localities. Several of the correspondents claimed that it was becoming so beneficial that spraying was hardly necessary. It was known to attack the larvæ and nymphs. The method of its attack was to pierce with its mouth-parts the soft skin of the larvæ or nymph and suck out all the liquid contents of the host's body, thus insuring a sure and sudden death.

There seems to have been a northward spread of this insect, as it was not formerly known to occur as far north as Illinois, and here we have it in 1908 and 1909 in Michigan, and in Ontario in 1911.

M. A. YOTHERS, Pullman, Wash.

NOTES ON THE NORTH AMERICAN SPECIES OF GRAPTA
IN THE BRITISH MUSEUM.

BY HENRY H. LYMAN, MONTREAL.

In the 36th Annual Report of the Entomological Society of Ontario for 1905 appeared a very interesting paper by Mrs. Nicholl on "Butterfly Collecting in Canada, 1904," followed by some critical notes by the late Dr. James Fletcher.

Mrs. Nicholl appears to have consulted Mr. Henry Elwes in regard to at least some of the determinations, but I do not know whether all her specimens were examined by him or not.

On page 76 *Polygonia (Grapta) gracilis* is recorded as having been taken at Ottawa and Montreal; the latter locality, however, I believe to be erroneous. I do not know that there is any inherent reason why it should not occur here, but the fact remains that we have had a flourishing branch of the Entomological Society of Ontario in active operation here for 38 years, and no specimen of that species has ever been taken here by any of our members.

December, 1911

Last year I paid several visits to the British Museum, and made a special study of the North American Graptas, having taken over with me authentic specimens of nearly all the known species from my own collection for comparison. Mr. Heron was absent on account of a breakdown of his health, but when I had examined the same drawers in 1906 he told me that they had been arranged by Mr. Elwes, and there was a memorandum in Mr. Elwes's writing stating that he had arranged them in accordance with the views of the leading North American entomologists, though he did not concur in their views.

Last year I found in the first drawer the following note: "The arrangement of this drawer is only provisional. I have not studied the very diffuse literature now.—H. J. E.

"I have left the names on the labels to show what the Americans call them."

My notes on the contents are as follows:

Progne, 4 specimens.

No. 1 is *fœunus* from Nepigon.

Nos. 2, 3 and 4 are correct (Nos. 2 and 4 bred by J. Fletcher, Ottawa, No. 3 also from Ottawa), from the Crowley bequest.

Over a label

Comma
Harris
syn. *Dryas* Edw.
syn. *Harrisii* Edw.

stand five specimens.

No. 1 is *progne* from Nova Scotia, below N. S. is "Redmayne?"; and the specimen has a pin label with the correct name.

No. 2 is var. *dryas* ♂, and is labeled:

I believe this and following labels with name "*Grapta c-album* Linn." to be in Mr. Heron's writing.

Nova Scotia.
Hewitson Coll.
Grapta c-album Linn.

No. 3 is *satyrus* ♂, and is labeled:

N. America.
Hewitson Coll.
Grapta c-album Linn.

No. 4 is *dryas* ♂, apparently, but the secondaries are less clouded than usual. It is from W. Va., and bears a label in the writing of the late W. H. Edwards.

Comma ♂
Dimorphic from *dryas*.

No. 5 is *comma*, var. *harrisii*, from N. Y., but is marked *dryas* on the pin label.

The next row of specimens has a label *dryas* at the foot.

One specimen at top of row is *faunus*, from the Elwes collection, and was taken at Nepigon, 29, vii, 93.

Then a vacant space of four inches, then one *progne* bred from currant by Fletcher and labeled :

Progne
fide Fletcher

Then another space of about four inches, then two specimens of *progne*, one from Maine and the other labeled :

Nova Scotia.
Redmayne ?

Then three *comma*, var. *harrisii*, ♀. The first from Zeller collection, and labeled "West Virginia" in W. H. E's writing. The next labeled :

N. America.
Hewitson Coll.
Grapta c-album Linn.

The last is from New York, and is labeled on the pin in error "var. *dryas*."

Next follow two rows with label at foot, *harrisii*.

First row :

No. 1 is *faunus*, from the White Mts., N. H.

No. 2 is a very interesting form from Albany River, Hudson's Bay Territory, taken by Geo. Barnston, which seems to stand about midway between *progne* and *gracilis*, the silver mark being L-shaped as nearly as possible, forming a right angle, but the border is not nearly as silvery as in typical *gracilis*. It bears a pin label "*G. gracilis*," by Heron.

No. 3 is *faunus*, from Albany River, H. B. Barnston, and has a correct pin label by Heron.

No. 4 is *faunus*, from New York.

No. 5 is the same, but also marked from "Elwes collection."

No. 6 is *faunus*, from Nova Scotia.

No. 7 is *comma*, var. *harrisii* ♂, from N. J., from Dr. Strecker, Elwes collection.

No. 8 is *comma*, var. *harrisii*, West Va., the written pin label by W. H. E.

Second row :

No. 1 is *faunus*, from White Mts., N. H.

No. 2 is similar to the corresponding specimen in the first row, and same locality and collector.

No. 3 is *faunus*, from N. Y., Elwes collection.

Then there is a space of three inches.

No. 4 is *faunus*, and is labeled :

Nova Scotia. Hewitson Coll. <i>Grapta c-album</i> Linn.

No. 5 is *comma*, var. *harrisii* ♀, N. J., Strecker, Elwes collection.

No. 6 is *comma*, var. *harrisii* ♂.

Then a 2-inch space.

No. 7 is *comma*, var. *dryas* ♀, from Ottawa, Crowley bequest.

No. 8 is *comma*, var. *dryas* ♀, W. Va., labeled W. H. E.

The remainder of the drawer is filled with *Grapta interrogationis*, var. *fabricii* and var. *umbrosa*, which are correctly arranged.

In the next drawer there is a label as follows :

"After careful study of the western and Rocky Mts. forms and comparison with analogous varieties, sexual and climatic, in Europe and Asia, I cannot follow the distinctions adopted by Edwards and other American authors.—H. J. ELWES, Jan. 3, 1905."

In this drawer there are very interesting specimens, but so badly mixed that I gave up in despair, as the same species sometimes stood under two or even three names, and there were labels on long pins stuck promiscuously about the drawer like Dervish standards.

There is no typical specimen of *gracilis* as found in eastern Canada and the North-eastern States of the American Union in the collection, which may account for Mrs. Nicholl's erroneous record of that pre-eminently beautiful species from Montreal.

I have rarely examined a collection without finding at least some of the *Graptas* misnamed.

GNORIMOSCHEMA SEPTENTRIONELLA, N. SP.

BY REV. THOMAS W. FYLES, HULL, P. Q.

Locality : North Wakefield, Province of Quebec.*Gall-plant* : *Aster junceus* Ait.

The Gall : Situated on the stem of the plant, 6 inches from the ground and 8 inches from the summit of the panicle of blossoms; fusiform, one inch long, half an inch in diameter at the widest part; contained no trace of a web.

Imago : Appeared in the middle of September; 20 millimetres in expanse of wings: 10 millimetres in length of body. *Head* brown, mottled with gray. *Palpi* recurved (drooped in drying), 2 millimetres long, dentate on the inner edge of the second segment. *Antennæ* six millimetres long, filiform, brown. *Thorax* and *abdomen* dark brown, the latter somewhat hoary towards the end. *Fore wing* brown; taken lengthwise the costal half of the wing is of a warmer hue than the inner half. The outward third of this costal part is striped with brown and rosy gray. The fringe of the fore wing is 3 millimetres long; it has a rosy glow towards the outer angle, and is beautifully marked with minute brown spots. *Hind wing* dark gray, $3\frac{1}{2}$ millimetres at the longest part, light brown. *Legs* : tibiæ of hindmost pair set all round, and all their length, with long hairs. The joints of the tarsi are edged with gray.

ENTOMOLOGICAL SOCIETY OF AMERICA.

The sixth annual meeting of the Entomological Society of America will be held in Washington, D. C., Tuesday and Wednesday, Dec. 26 and 27, in affiliation with meetings of the American Association for the Advancement of Science, and other affiliated societies. Meetings will be held Tuesday forenoon and afternoon, beginning at 10.00 a.m., and on Wednesday forenoon. The meetings of the American Association of Economic Entomologists will begin Wednesday afternoon with the President's address, and other meetings on Thursday, and Friday forenoon, followed by the meetings of the Horticultural Inspectors.

The annual address will be given by Prof. John Henry Comstock, of Cornell University, on Wednesday evening, December 27, at 8.00 p.m. His subject will be "On some Biological Features of Spiders." It will be illustrated by lantern slides.—Extract from announcement.

Mailed December, 12th, 1911

INDEX TO VOLUME XLIII.

- Acoloides aureus*, n. sp., 292.
 Acronarista, characters of, 313.
 " mirabilis, 313.
 Acronycta canadensis, 148.
 " cretata, 149.
 " emaculata, 150.
 " illita, 150.
 " manitoba, 149.
Adelphomyia minuta, n. sp., 286.
Enasioidea, n. gen., 171.
 " *latiscapus*, n. sp., 173.
Alaus oculatus, "eye spots" of, 190.
Alberta Lepidoptera, notes on, 143, 229, 281, 321, 329, 361, 393.
 ALDRICH, J. M., articles by, 34, 108.
 ALEXANDER, C. P., articles by, 286, 369.
Amphorophora howardii, n. sp., 59.
Anacampsis rhoifrutella, 32.
Anaphes gracilis, 133.
Andricus rugulosus, n. sp., 211.
 " *yosemite*, n. sp., 211.
Anæcia ænotheræ, n. sp., 63.
Anthophorula bruneri, 390.
Anytus obscurus, 398.
Apantesis, notes on two species of, 257.
Apantesis phyllira, 257.
 " *placentia*, 257.
Aphididæ, new genera and species of, 59.
Aphis minuta, n. sp., 60.
 " *sassceri*, n. sp., 59.
Apicrena, n. gen., 205.
 " *calcaria*, n. sp., 205.
Aplodes intensaria, n. sp., 25.
Arachnids from Spanish moss, 29.
Arge vs. *Hylotoma*, 122.
Arthrolytus æneoviridis, n. sp., 372.
 " *albiscapus*, 354.
 " *apatelæ*, 371, 412.
 " *clisiocampæ*, 376.
 " *incongruens*, 376.
Arthrolytus, notes on the genus, 346, 407.
Arthrolytus punctatus, 352.
 " *puncticollis*, 370.
 " *pimplæ*, 376.
 " table of species, 376.
Asilidæ, four new species of, 129.
Athalia colibri, 122.
Athysanus estacadus, n. sp., 200.
 " *uhleri*, n. sp., 200.
 BALL, E. D., article by, 197.
 BANKS, NATHAN, article by, 128.
 BARNES, WM., articles by, 257, 318.
 Bees from Western Canada, 33.
 Bees, new, from flowers of *Cactaceæ*, 131.
 Bees, records of, 389.
 Beetles found about foliage, 109.
 BETHUNE, C. J. S., articles by, 132, 140, 253, 320.
 BEUTENMULLER, WM., article by, 211.
 BIRD, HENRY, article by, 37.
Bonnetia, characters of, 265.
 Book Notices—
 Diptera Danica, 138.
 Genera Insectorum, Cicindelinae, 36.
 Insects and Disease, 105.
 Insects of Connecticut, 392.
 Insects of New Jersey, 328.
 Nature Sketches in Temperate America, 256.
 Schenkling's *Cleridæ*, 107.
 The Codling Moth, 180.
 The Genus *Pissodes*, 139.
 The House Fly, 294.
 The Prevention of Malaria, 105.
 The Tse-tse Flies, 295.
 Tower's Work on *Leptinotarsa*, 71.
Bothropyls multidentatus, 98.
 " *pusio*, 379.
 " *xanti*, 379.
 BOWDITCH, F. C., articles by, 9, 89, 207, 386, 415.
 BUENO, J. R. DE LA T., article by, 226.
Buethobius coniugans, n. sp., 384.
 BUSCK, AUGUST, article by, 4.
 Caliroa cerasi, 121.
Cantharis nuttalli, 327.
Capsidæ, life-histories of two species of, 17.
Carolinaia, n. gen., 61.
 " *caricis*, n. sp., 61.
 Catalogue of Canadian insects, 273.
 CAUDELL, A. N., articles by, 137, 156.
Cea immacula and allied species, 318.
Ceanothus ovatus as a host-plant, 32.
Ceratina dupla halophila, n. subsp., 390.
Ceroputo koebeleri, n. sp., 278.
 CHAGNON, GUSTAVE, article by, 1.
 CHAMBERLIN, R. V., articles by, 67, 98, 260, 378.

- Charidryas nycteis, 340.
Chlorochlamys appellaria, n. sp.
Chlorosea proutaria, n. sp., 250.
Chorizagrotis agrestis, 333.
 " *auxiliaris*, 333.
 " *inconcinna*, 333.
 " *introferens*, 333.
Chrysophanus dorcas, life-history of 160.
Chrysophanus zeroe, 83.
 COBLENZ, W. W., article by, 355.
 Coccidæ, new, with notes on other species, 275.
 COCKERELL, T. D. A., articles by, 33, 131, 208, 272, 389.
 Codling moth, egg parasite of, 133.
Coelopisthia nematocida, 298.
 Coleoptera from Steamboat Springs, Col., p. 208.
 Collecting notes from Cartwright, Man., 327.
 COMSTOCK, W. P., article by, 65.
 Conocephalids, notes on two, 413.
Conocephalus caudellianus, 413.
 " *exilis*, 413.
 COOLIDGE, K. R., articles by, 6, 50.
 COQUILLET, D. W., article, 66.
Cristatithorax, n. gen., 169.
 " *pulcher*, n. sp. 170.
 CROSBY, C. R., articles by, 17, 20, 414.
Cryptocampus, Euura vs., 122.
Culex borealis, n. sp., 178.
 Cymipidæ, two new species of, 211.

 DAVIS, WM. T., article by, 413.
Deltocephalus fraternus, n. sp., 201.
Deltocephalus fraternus, var. *mendosus*, n. var., 202.
Deltocephalus micarius, n. sp., 203.
Derostenus salutaris, n. sp., 414.
Diabrotica alternata, n. sp., 415.
 " *argo*, n. sp., 55.
 " *atomaria*, 9.
 " *atrobasalis*, n. sp., 97.
 " *baeri*, n. sp., 92.
 " *bakeri*, n. sp., 96.
 " *biannularis*, 14.
 " *bioculata*, n. sp., 16.
 " *boggiani*, n. sp., 94.
 " *bruchii*, n. sp., 389.
 " *callangaensis*, n. sp., 91.
 " *carinipennis*, n. sp., 387.
 " *castanea*, n. sp., 417.
 " *centrastigma*, n. sp., 417.
 " *chacoensis*, n. sp., 96.
 " *chimborensis*, n. sp., 54.
 " *Diabrotica clarkellita*, n. sp., 90.
 " *clio*, n. sp., 94.
 " *columbiensis*, n. sp., 53.
 " correction of name in, 207.
 " *delrio*, n. sp., 57.
 " *fraterna*, 9.
 " *fulvofasciata*, 9.
 " *funerea*, n. sp., 11.
 " *fusculus*, n. sp., 12.
 " *granulipennis*, n. sp., 387.
 " *hahneli*, n. sp., 10.
 " *inca*, n. sp., 386.
 " *juncto-linea*, n. sp., 95.
 " *klagii*, n. sp., 56.
 " *luenderwaldti*, n. sp., 90.
 " *mapiriensis*, n. sp., 89.
 " *neotrimaculata*, n. sp., 15.
 " *neolineata*, n. sp., 91.
 Diabrotica, new species of, 9, 53, 89, 386, 415.
Diabrotica nigrotibialis, n. sp., 415.
 " *pachitensis*, n. sp., 97.
 " *pallens*, n. sp., 416.
 " *pauperata*, 9.
 " *peckii*, n. sp., 53.
 " *peruensis*, n. sp., 93.
 " *piceopunctata*, n. sp., 14.
 " *purpurascens*, n. sp., 55.
 " *rendalli*, n. sp., 93.
 " *rosenbergi*, n. sp., 58.
 " *rufopustulata*, n. sp., 58.
 " *sancatarina*, n. sp., 11.
 " *semisulcata*, n. sp., 92.
 " *semiviridis*, n. sp., 13.
 " *septemplagiata*, n. sp., 57.
 " *songoensis*, n. sp., 56.
 " *suffusca*, 10.
 " *surinamensis*, n. sp., 89.
 " *tibialis*, 10.
 " *tucumanensis*, n. sp., 389.
 " *underwoodi*, n. sp., 95.
 " *unicincta*, n. sp., 13.
 " *variolosa*, 10.
 " *vittula*, n. sp., 388.
 Diptera, from Kearney, Ont., 237.
 DOD, F. H. WOLLEY, articles by, 104, 143, 229, 281, 321, 329, 361, 393.

 EHRHORN, E. M., article by, 275.
Empria cæca, n. sp., 308.
 " *cætrata*, n. sp., 305.
 " *calda*, n. sp., 307.
 " *callida*, n. sp., 305.
 " *callosa*, n. sp., 305.
 " *candidula*, n. sp., 310.
 " *canora*, n. sp., 310.

- Empria capillata*, n. sp., 341.
 " *caprina*, n. sp., 307.
 " *captiosa*, n. sp., 308.
 " *carbacea*, n. sp., 341.
 " *cariosa*, n. sp., 309.
 " *casca*, n. sp., 310.
 " *casta*, n. sp., 307.
 " *castigata*, n. sp., 309.
 " *cata*, n. sp., 307.
 " *cauduca*, n. sp., 309.
 " *cauta*, n. sp., 311.
 " *cava*, n. sp., 306.
 " *cavata*, n. sp., 305.
 " *celebrata*, n. sp., 308.
 " *celsa*, n. sp., 306.
 " *conciliata*, n. sp., 344.
 " *concisa*, n. sp., 346.
 " *concitata*, n. sp., 342.
 " *concreta*, n. sp., 344.
 " *condensa*, n. sp., 342.
 " *condita*, n. sp., 342.
 " *conferla*, n. sp., 344.
 " *confirmata*, n. sp., 443.
 " *contexta*, n. sp., 345.
 " *contorta*, n. sp., 343.
 " *culpata*, n. sp., 343.
 " *cumulata*, n. sp., 343.
 " *cuneata*, n. sp., 345.
 " *cespida*, n. sp., 346.
 " *curata*, n. sp., 348.
 " *epecta*, n. sp., 310.
 " *kincaidi*, n. sp., 345.
 " new species of, 305, 341.
Encyrtinae, new genera and species of, 168.
 Entomological field work, notes on, 22.
 Entomological Society of America, 124, 422.
Eriocampoides, 119.
Eriococcus eriogoni, n. sp., 276.
 " *salinus*, n. sp., 276.
Eubaphe immaculata, 146.
Eupithecia, a new, 255.
 " *chagnoni*, n. sp., 255.
Euptoieta claudia, at Toronto, 340.
Euretagrotis inattenta, 324.
Euura vs. *Cryptocampus*, 122.
Euxoa alticola, 366.
 " *cariosus*, 363.
 " *cogitans*, 338.
 " *declarata*, 367.
 " *divergens*, 396.
 " *focinus*, 369.
 " *holoberba*, 363.
 " *idahoensis*, 394.
 " *incallida*, 362.
 " *laganae*, 362.
Euxoa maimes, 337.
 " *megastigma*, 339.
 " *mollis*, 365.
 " *nordica*, 395.
 " *ochrogaster*, 393.
 " *olivalis*, 336.
 " *pestula*, 361, 369.
 " *pugionis*, 337.
 " *redimacula*, 396.
 " *rena*, 366.
 " *reticincta*, 362.
 " *reuda*, 365.
 " *ridingsiana*, 337.
 " *rumatana*, 336.
 " *scandens*, 339.
 " *tessellata*, 368.
 " *testula*, 362.
 " *tristricula*, 397.
 " *vallus*, 361.
 " *vulpina*, 339.
 EVANS, J. D., article by, 328.
 FELT, E. P., article by, 134, 194.
Feltia ducens, 334.
 " *hudsoni*, 334.
 " *obliqua*, 335.
 " *vancouverensis*, 335.
 " *venerabilis*, 335.
 FYLES, T. W., articles by, 135, 256, 422.
Gædiopsis, table of species, 315.
 Gall-making moths on *Solidago* and *Aster*, 4.
 Gall midges, two new, 194.
Geometridæ from the Southwest, 207.
 " new, 250.
Geometrid, a new Canadian, 225.
Geometrid genus, a new, and a new Southwestern species, 205.
Georgia, n. gen., 64.
 " *ulmi*, n. sp., 64.
 GIBSON, ARTHUR, articles by, 125, 157.
 GIRAULT, A. A., articles by, 133, 168, 192, 292, 346, 370, 407.
Gnorimoschema gallæasterella, 6, 135.
 " *gallædiopappi*, 135.
 " *gallæsolidaginis*, 4.
 " *salinaris*, n. sp., 4.
Gnorimoschema septentrionella, n. sp., 422.
Gnorimoschema subterranea, n. sp., 5.
 Grapta, notes on N. Am. species in British Museum, 418.
 GROSSBECK, J. A., articles by, 225.

- Hadena alberta*, 235.
 " *albertina*, 282.
 " *alia*, 229.
 " *allecto*, 282.
 " *barnesii*, 236.
 " *cerivana*, 230.
 " *cinefacta*, 235.
 " *cogitata*, 232.
 " *contradicta*, 229.
 " *devastatrix*, 233.
 " *egens*, 282.
 " *enigma*, 235.
 " *ferens*, 234.
 " *indocilis*, 229.
 " *lateritia*, 231.
 " *montana*, 281.
 " *passer*, 155.
 " *rorulenta*, 229.
 " *sora*, 281.
 " *unita*, 235.
 " *versuta*, 233.
Hadenella tonsa, 152.
 HADWEN, SEYMOUR, article by, 141.
Hæmatobia serrata, mites infesting, 141.
 HAHN, PAUL, article by, 340.
Halobatopsis beginii, 226.
 HEATH, E. F., articles by, 245, 327.
Hepialid moth, peculiar habits of a, 289.
Hepialus confusus, 292.
 " *hyperboreus*, 290.
 " *macglashani*, 291.
 " *matthewi*, 292.
 " *pulcher*, 291.
 " *roseicaput*, 292.
Heterocordylus malinus, 17.
 HEWITT, C. G., articles by, 105, 138, 142, 180, 273, 294, 295, 298, 311.
Hillia senescens, 154.
 " *vigilans*, 154.
Homohadena badistriga, 285.
 Honey-bee, danger of pollution by, 31.
Horismenus microgaster, 407.
 Horn fly, mites infesting, 141.
 HUNTSMAN, A. G., article by, 71.
Hydriomena cochiseata, 80.
 " *furcata*, 74.
Hydriomena furcata, var. *albifasciata*, 77.
Hydriomena furcata, var. *elutata*, 75.
 " " " *periclata*, 77.
Hydriomena furcata, var. *quinquefasciata*, 75.
Hydriomena furcata, var. *resecta*, 76.
Hydriomena furcata, var. *sordidata*, 76.
Hydriomena furcata, var. *viridata*, 76.
 " *irata*, 81.
 " *manzanita*, 80.
 " *nubilifasciata*, 79.
Hydriomena nubilifasciata, var. *cumulata*, 80.
Hydriomena nubilifasciata, var. *cupidata*, 79.
Hydriomena nubilifasciata, var. *rapitata*, 79.
Hydriomena nubilifasciata, var. *sca-lata*, 80.
Hydriomena nubilifasciata, var. *sparsimacula*, 80.
Hydriomena nubilifasciata, var. *vulnerata*, 80.
Hydriomena pernotata, 81.
 " *reflata*, 78.
Hydræcia repleta, n. sp., 47.
Hylotoma, *Arge* vs., 122.
Hyppa brunneicrista, 285.
 " *xylinoides*, 284.
Idionotus brevipes, habits and stridulation of, 303.
 Inbreeding of Lepidoptera, 212.
 Insects from cotton and corn, 26.
 " from dry cornstalks, 25.
 " from dry cotton bolls, 23.
 Insects from Steamboat Springs, Col., 208.
 International Congress of Entomology, 406.
Ipidæ, new species of, 213.
Ips borealis, n. sp., 213.
 " *latidens*, 215.
 " *longidens*, n. sp., 214.
Jassidæ, new North American, 197.
Kermes pubescens, Chalcidoid parasites of, 168.
Kermes shastensis, n. sp., 275.
Lampyridæ, colour of light emitted by, 355.
Lamyctes fulvicornis, 98.
Laphria dispar, n. sp., 130.
 Leaf-roller, on *Viburnum prunifolium*, 32.
Lecontea lucifera, light-emission of, 403.
 Lepidoptera from Cartwright, Man., 245.

- Lepidoptera from St. Fabien, Que., 1.
 " male genitalia in, 181.
 Lepidoptera, notes on Alberta, 143,
 229, 281, 321, 329, 361, 393.
 Light-emission of Lampyridæ, 399.
Linnæmya anthracina, n. sp., 266.
 " characters of, 265.
Linotenis chionophila, 260.
 Lithobiomorpha of Colorado, 67.
 Lithobiomorpha of San Francisco Bay,
 378.
 Lithobiomorpha of Wisconsin, 98.
Lithobius angelus satanas, n. subsp.,
 381.
*Lithobius bilabiatu*s, 103.
 " *b*ius, n. sp., 102.
 " *c*ardinalis, 103.
 " *c*eler, 102.
 " *c*oloradensis, 70.
 " *d*opaintus, n. sp., 69.
 " *e*xiguus, 104.
 " *f*orficatus, 69, 101.
 " *h*arrietæ, 69.
 " *h*olzingeri, 104.
 " *h*owei, 101.
 " *j*owensis, 70, 103.
 " *j*uventus, 101.
Lithobius, Key to Colorado species of,
 67.
Lithobius, Key to Wisconsin species of,
 99.
Lithobius, *kochii*, 380.
 " *m*innesotæ, 104.
 " *m*ordax, 68, 101.
 " *n*umius, n. sp., 102.
 " *o*besus, 380.
 " *œ*dipes, 68.
 " *p*atonius, n. sp., 381.
 " *p*olitus, 103.
 " *p*roridens, 103.
 " *p*ullus, 103.
 " *s*exdentatus, 103.
 " *s*ulcipes, 260.
 " *t*iganus, 380.
 " *t*ivius, 69, 104.
 " *t*rilobus, 104.
 " *t*yrranus, 101.
Lobodiplosis coccidarum, n. sp., 195.
 LUDLOW, C. S., article by, 178.
Luperina niveivenosa, 155.
Lycæna fulla, 85.
 Lycænid butterflies, life-histories of
 two, 83.
Lygidea mendax, 17.
 LYMAN, H. H., article by, 418.
Lythrodes tripuncta, n. sp., 319.
 MACGILLIVRAY, ALEX. D., articles by,
 124, 305, 341.
Mallophora fulva, n. sp., 130.
 Mastor, 6.
 " bellus, 7.
 " phylace, 7.
 McDERMOTT, F. A., articles by, 190,
 399.
 McDUNNOUGH, JAMES, articles by, 181,
 257, 289, 318.
Megachile sapellonis, 391.
 Meigen's 1800 paper, a decision on, 34,
 66.
Melissodes opuntiella, n. sp., 131.
Melitæa theona, 50.
Metopia lateralis, 314.
 " *l*eucocephala, 314.
 Miastor larvæ, 135.
Microterys cincticornis, n. sp., 175.
 " *s*peciosissimus, n. sp., 175.
 Mites infesting horn fly, 141.
 Monima revicta, life history of, 157.
 MORRIS, F. J. A., article by, 109.
 Mosquito, new Alaskan, 178.
 Myriopods, notes on species from
 Alaska and Washington, 260.
Nemastoma dasyncnemum, 20.
Neopasites robertsoni, 390.
Neotrichogramma japonicum, identity
 of, 192.
 NEWCOMB, W. W., article by, 160.
 NEWCOMER, E. J., article by, 83.
Noctua baja, 325.
 " *c*algary, 330.
 " *c*ynica, var. *p*erumbrosa, 326.
 " *d*islocata, 330.
 " *h*avilæ, 332.
 " *i*nopinatus, 331.
 " *p*atefacta, 326.
 " *r*osaria, 329.
 " *u*nicolor, 332.
 Noctuidæ, life-histories of Canadian,
 157.
 NORTON, ARTHUR H., article by, 385.
 Obituary Notices—
 Coquillett, D. W., 311.
 Scudder, Dr. S. H., 253.
 Seifert, Otto, 16.
Ommatius maculatus, n. sp., 128.
 " *p*retiosus, n. sp., 129.
Oncocnemis cibalis, 321.
 " *p*oliochroa, 286.

- Orthoptera, a new species from Texas, 137.
 Orthoptera, notes on, 156.
 OSBORN, HENRY, article by, 52.
Oslaria pura, n. sp., 319.
Osmia hesperella, 309.
- Pachnobia littoralis, 324.
 Papaipema arctivorens, 44.
 " cataphracta, 43.
 " erubescens, n. sp., 39.
 " fluxa, n. ab., 44.
 " harrisii, 37.
 " mæseri, n. sp., 42.
 " nepheletena, 43.
 Papaipema, new histories and species of, 37.
 Papaipema rigida, 47.
 " rubiginosa, n. ab., 40.
 PEARSALL, R. F., article by, 205, 250.
 Pear Slug, 119.
Pergandeida nigra, n. sp., 62.
Peridroma margaritosa, 324.
Perillus bioculatus, 320.
 " circumcinctus, 320.
Perillus claudus, a beneficial insect, 418.
 Phalangida, a new Missouri species of, 20.
Phlepsiis nudus, n. sp., 204.
 Phlæophthorus, characters of, 221.
 Phlæotribus, characters of, 222.
 " frontalis, 223.
 " liminaris, 223.
 " piceæ, n. sp., 220, 223.
 " puberulus, 221, 223.
Pholus pandorus, at Toronto, 340.
Phorbia fusciceps, mortality of, due to fungus, 31.
Photinus pyralis, colour of light emitted by, 356.
Photinus pyralis, light-emission of, 399.
Photuris pennsylvanica, colour of light emitted by, 356.
Phragmatobia assimilans, var. franconia, preparatory stages of, 125.
Phylodarea subcostata, n. sp., 287.
Pieris protodice, 327.
 Plant-bugs, biting propensities of, 29.
Polia contacta, 283.
 " medialis, 283.
Porosagrotis retusta, 335.
 Potato beetle, eating eggs of its kind, 385.
Prestwichia aquatica, characters of 209.
- Pseudolithobius megaloporus*, 382.
Psenulus (Neofoxia) townsendi, n. sp., 272.
 Psenid wasp from Peru, a new, 272.
- Rhynchagrotis gilvipennis, 321.
 " placida, 322.
Rhynchites betulæ, habits of, 112.
 ROHWER, S. A., article by, 119.
- SANDERS, G. E., article by, 48.
 Saunders, Dr. William, 140.
 Sawfly, turnip, 121.
 SCHAEFFER, CHAS., article by, 254.
Schizotachina, characters of, 268, 313.
 " convecta, 271.
 " vitinervis, n. sp., 268.
Scytonotus bergrothi, n. sp., 262.
Selidosema manitoba, n. sp., 225.
 SKINNER, DR. HENRY, article by, 406.
Smerinthus cerisyi, 132.
 " " habits of, 104.
 " geminatus, habits of, 104.
Sphæridium bipustulatus at New York City, 254.
Sphærococcus cupressi, n. sp., 277.
Stamnodes affiliata, n. sp., 252.
Stipator mitchelli, n. sp., 137.
 SWAINE, J. M., article by, 213.
 SWETT, L. W., articles by, 73, 255.
- Tachinidæ, new and old, 265, 313.
 Tenthredinoidea, notes on and description of new species, 119.
Thamnotettix intricata, n. sp., 198.
 " kirkaldyi, n. sp., 197.
 " rupinata, n. sp., 199.
 " schwartzi, n. sp., 197.
- Thecla chrysalus*, 65.
 " " var. citima, 65.
 THOMPSON, W. R., articles by, 265, 313.
 Tipulidæ, Canadian, 369.
 " new, 286.
Toxomyia rubida, n. sp., 194.
Trichogramma japonicum, identity of, 192.
Trionymus californicus, n. sp., 279.
Tropidopria conica, notes on breeding of, 48.
Trypodendron betulæ, n. sp., 216.
 " lineatus, 216.
 TUCKER, E. S., article by, 22.

VAN DUZEE, M. C., article by, 237.

WALKER, E. M., articles by, 16, 139,
303, 340, 392.

WICKHAM, H. F., article by, 36.

WILSON, H. F., article by, 59.

WINN, A. F., article by, 212.

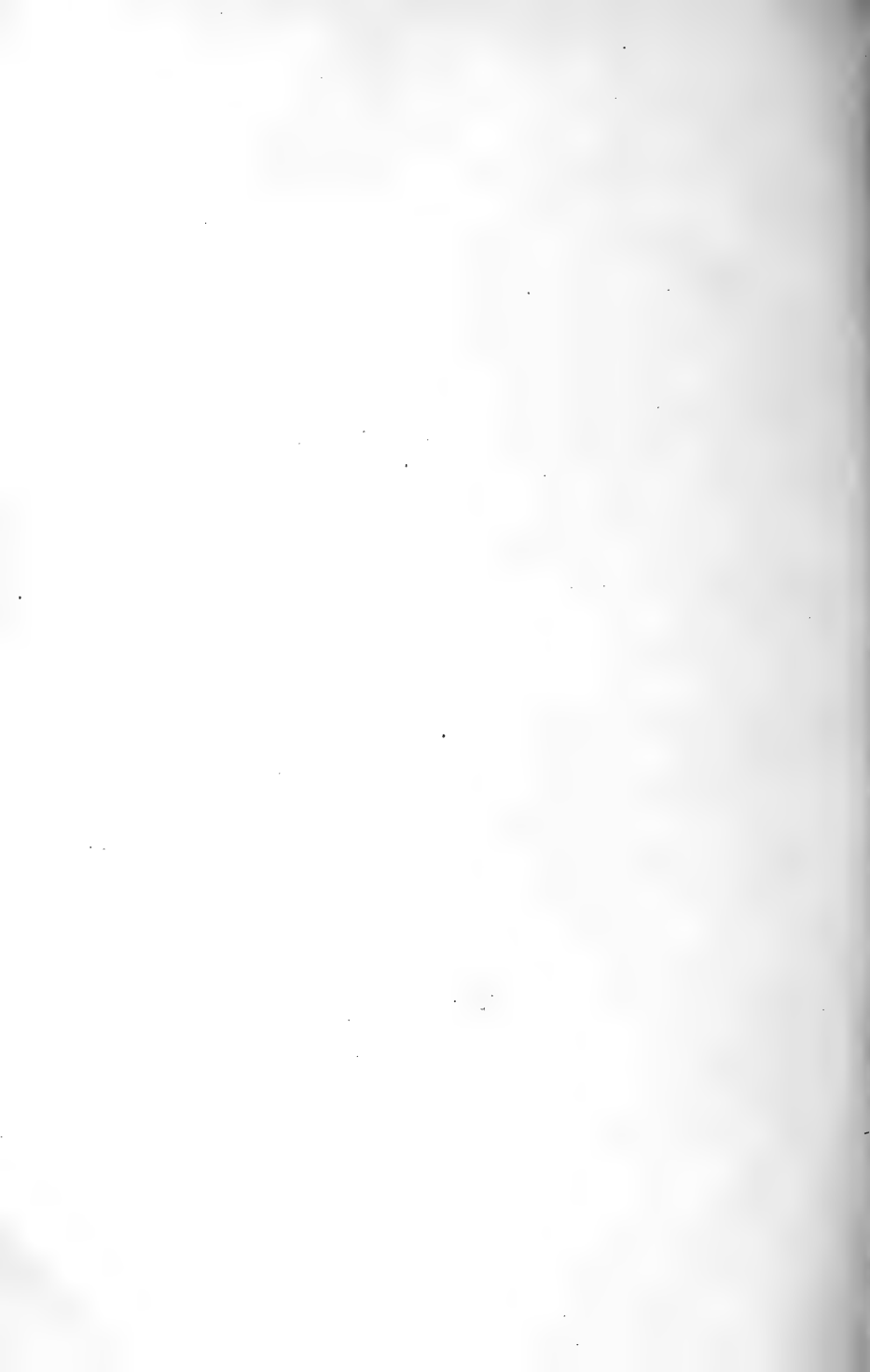
WOLCOTT, A. B., article by, 108.

Xylococcus macrocarpæ, 279.

YOTHERS, M. A., article by, 418.

Zygethobius dolichopus, 67.

“ *sokariensis*, n. sp., 383.



75
112

The Canadian Entomologist

VOLUME XLIII.

No. 1.

CONTENTS.

Chagnon—Lepidoptera taken at St. Fabien, Que.....	1
Busck—Gall-making Moths on Solidago and Aster.....	4
Coolidge—The genus Mastor, Godman and Salvin	6
Bowditch—Notes on Diabrotica and descriptions of new species.....	9
Obituary—The late Otto Seifert.....	16
Crosby—Life-history of two species of Capsidæ.....	17
Crosby—A new species of Phalangida from Missouri.....	20
Tucker—Random notes on Entomological Field-work.....	22
Cockerell—Some Bees from Western Canada.....	33
Aldrich—A decision on Meigen's 1800 paper.....	34
Wickham—Review of Walter Horn's Cicindelinae.....	36

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Editor Emeritus: REV. C. J. S. BETHUNE.

JANUARY, 1911.

LONDON:

LONDON PRINTING AND LITHOGRAPHING COMPANY.
1911.

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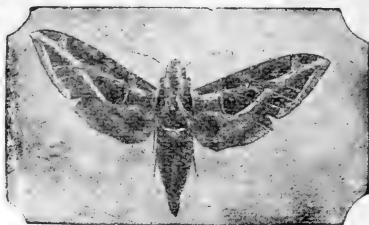
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CONTENTS.

Bird—New Histories and species in <i>Papaipema</i> and <i>Hydræcia</i>	37
Sanders—Notes on the breeding of <i>Tropidopria conica</i>	48
Coolidge— <i>Melitæa theona</i> and its synonymy	50
Bowditch—Notes on <i>Diabrotica</i> and descriptions of new species	53
Wilson—New genera and species of the family <i>Aphididæ</i>	59
Comstock— <i>Thecla chrysalus</i> and its variety <i>citima</i>	65
Coquillett—"A decision on Meigen's 1800 paper"	66
Chamberlin—The <i>Lithobiomorpha</i> of Colorado	67
Book Notice—Tower's work on <i>Leptinotarsa</i>	71

EDITED BY

DR. E. M. WALKER,

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UNIVERSITY OF TORONTO, TORONTO.

Editor Emeritus: REV. C. J. S. BETHUNE.

FEBRUARY, 1911.

LONDON:

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VOLUME XLIII.

No. 3.

CONTENTS.

Swett—Geometrid notes on the genus <i>Hydriomena</i>	73
Newcomer—Life-histories of two <i>Lycænid</i> Butterflies.....	83
Bowditch—Notes on <i>Diabrotica</i> and descriptions of new species (continued). ..	89
Chamberlin—The <i>Lithobiomorpha</i> of Wisconsin.....	98
Dod—Habits of <i>Smerinthus geminatus</i> and <i>cerisyi</i>	104
Hewitt—Insects and Disease.....	105
Wolcott— <i>Coleopterorum Catalogus: Cleridæ</i>	107
Aldrich—Meigen 1800 once more.....	108

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CONTENTS.

Morris—Beetles found about foliage.....	109
Rohwer—Notes on Tenthredinoidea—Part xiii.....	119
MacGillivray—5th Annual Meeting, Entomological Soc. of America.....	124
Gibson—Early stages of <i>Phragmatobia assimilians</i> , etc.....	125
Banks—Four new species of Asilidae.....	128
Cockerell—New Bees from flowers of Cactaceæ.....	131
Bethune— <i>Smerinthus cerisyi</i>	132
Girault—Egg-parasite of the Codling Moth.....	133
Felt— <i>Miastor</i> larvæ.....	134
Fyles— <i>Gnorimoschema gallae-diplopappi</i> and <i>G. g-asterella</i>	135
Caudell—A new species of Orthoptera from Texas.....	137
Hewitt—Lundbeck's <i>Diptera Danica</i>	138
Book Notice—Hopkins's Monograph of the Bark-beetles.....	139
Dr. William Saunders.....	140

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No. 5.

CONTENTS.

Hadwen—Observations on Mites infesting the Horn Fly.....	141
Dod—Further notes on Alberta Lepidoptera (continued).....	143
Caudell—Notes on Orthoptera	156
Gibson—Studies in the life-histories of Canadian Noctuidæ.....	157
Girault—Chalcidoid Parasites on <i>Kermes pubescens</i> , etc.....	168
Ludlow—A New Alaskan Mosquito.....	178
Caesar's—"The Cedling Moth"—(Book review)	187

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Editor Emeritus: REV. C. J. S. BETHUNE.

MAY, 1911.

LONDON:

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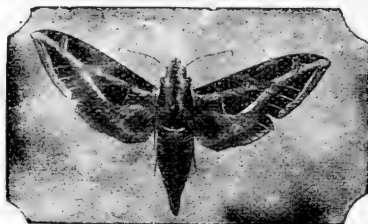
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CONTENTS.

McDunnough—The Nomenclature of the male Genitalia in Lepidoptera....	181
McDermott—The eye-spots of <i>Alaus oculus</i>	190
Girault—The identity of <i>Trichogramma japonicum</i>	192
Felt—Two new Gall-mites	194
Ball—Additions to the Jassid fauna of N. America	197
Pearsall—A new Geometrid genus and species.....	205
Bowditch—Correction of Name in <i>Diabrotica</i>	207
Cockerell—Some insects from Steamboat Springs, Colo., III.....	208
Girault—The essential characteristics of <i>Prestwiehia aquatica</i>	209
Beutenmuller—Two new species of Cynipidæ.....	211
Notes, errata, etc.....	204-212

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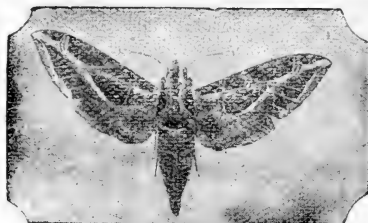
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CONTENTS.

Swaine—New species of <i>Ipidæ</i>	213
Grossbeck—A new Canadian Geometer.....	225
Bueno—On <i>Halobatopsis Bégini</i>	226
Dod—Notes on Alberta Lepidoptera.....	229
Van Duzee—Diptera taken at Kearney, Ont.....	237
Heath—Capture of Lepidoptera at Cartwright, Man.....	245
Pearsall—Geometridæ as yet undescribed.....	250
Bethune—The late Dr. S. H. Scudder.....	253
Schaeffer— <i>Sphæridium bipustulatus</i>	254
Swett—A new <i>Eupithecia</i>	255
Book Notice.....	256

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CONTENTS.

Hewitt—On <i>Cælopathia nematocida</i> Pack	297
Walker—On the Habits and Stridulation of <i>Idionotus brevipes</i> Caudell.....	304
MacGillivray—New species of <i>Empria</i>	305
Hewitt—The late Daniel William Coquillett.....	311
Thompson—Tactinidæ, new and old.....	313
Barres and McDunnough—On <i>Cea immacula</i> and allied species.....	318
Bethune—Predaceous bugs	320
Dod—Alberta Lepidoptera (continued).....	321
Heath—Collecting notes from Cartwright, Man.....	327
Book Notice : Insects of New Jersey.....	328

EDITED BY

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Editor Emeritus : REV. C. J. S. BETHUNE.

SEPTEMBER, 1911.

LONDON :

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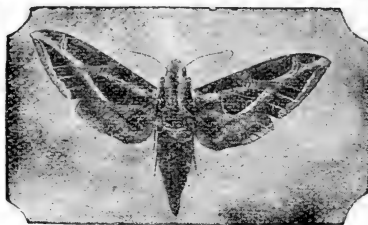
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CONTENTS.

Dod—Further notes on Alberta Lepidoptera.....	329
Rare captures of Lepidoptera.....	340
MacGillivray—New species of Empria.—II.....	341
Girault—The Genus Arthrolytus.....	346
Coblentz—The colour of the light emitted by Lampysidæ.....	355

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LONDON:

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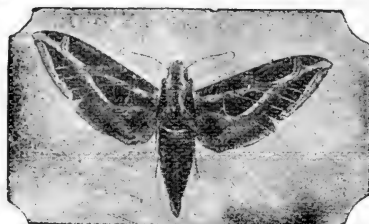
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No. 11.

CONTENTS.

Dod—Further Notes on Alberta Lepidoptera.....	361
Alexander—Canadian Tipulidæ.....	369
Girault—The Genus <i>Arthrolytus</i>	370
Chamberlin— <i>Lithobiomorpha</i> from San Francisco Bay.....	378
Norton—Potato beetle eating eggs of its own kind	385
Bowditch—Further Notes on <i>Diabrotica</i>	386
Cockerell—Records of Bees.....	389
Yothers— <i>Perillus claudus</i> a beneficial insect	391
Book Notice—Guide to the Insects of Connecticut.....	392

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No. 12.

CONTENTS.

Dod—Further Notes on Alberta Lepidoptera	393
McDermott—Light-emission of American Lampyridæ.....	399
Second International Congress of Entomology.....	406
Girault—The Genus <i>Arthrolytus</i>	407
Davis—Notes on two <i>Conocephalids</i>	413
Crosby—A new species of <i>Derostenus</i>	414
Bowditch—Further Notes on <i>Diabrotica</i>	415
Yothers— <i>Perillus claudus</i> a beneficial insect	418
Lyman—North American species of <i>Grapta</i> in the British Museum	418
Fyles— <i>Gnocrimoschema septentrionella</i> , n. sp.....	422
Entomological Society of America	422
Index.....	423

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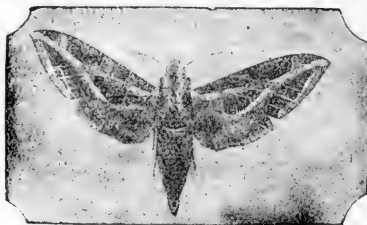
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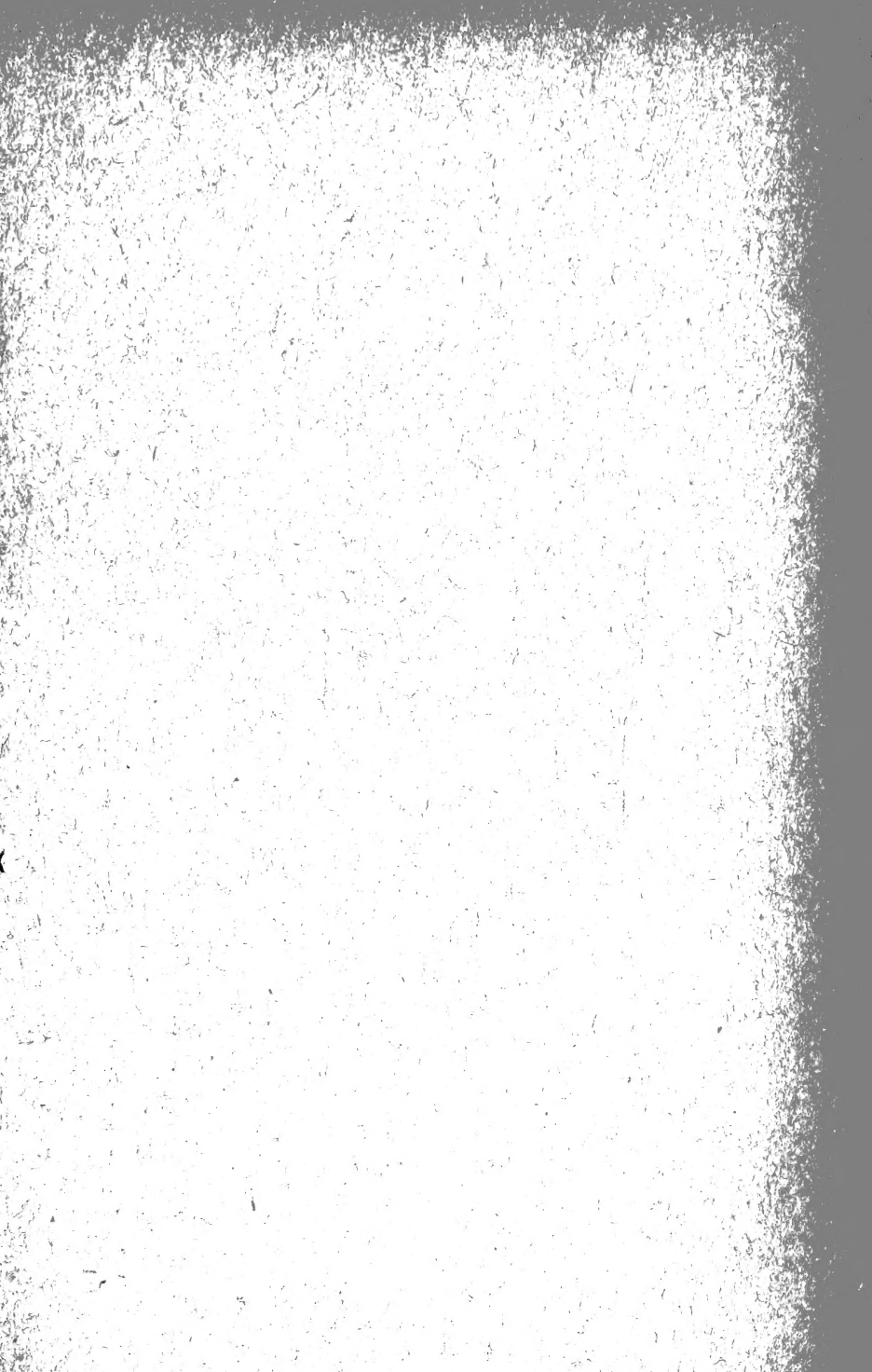
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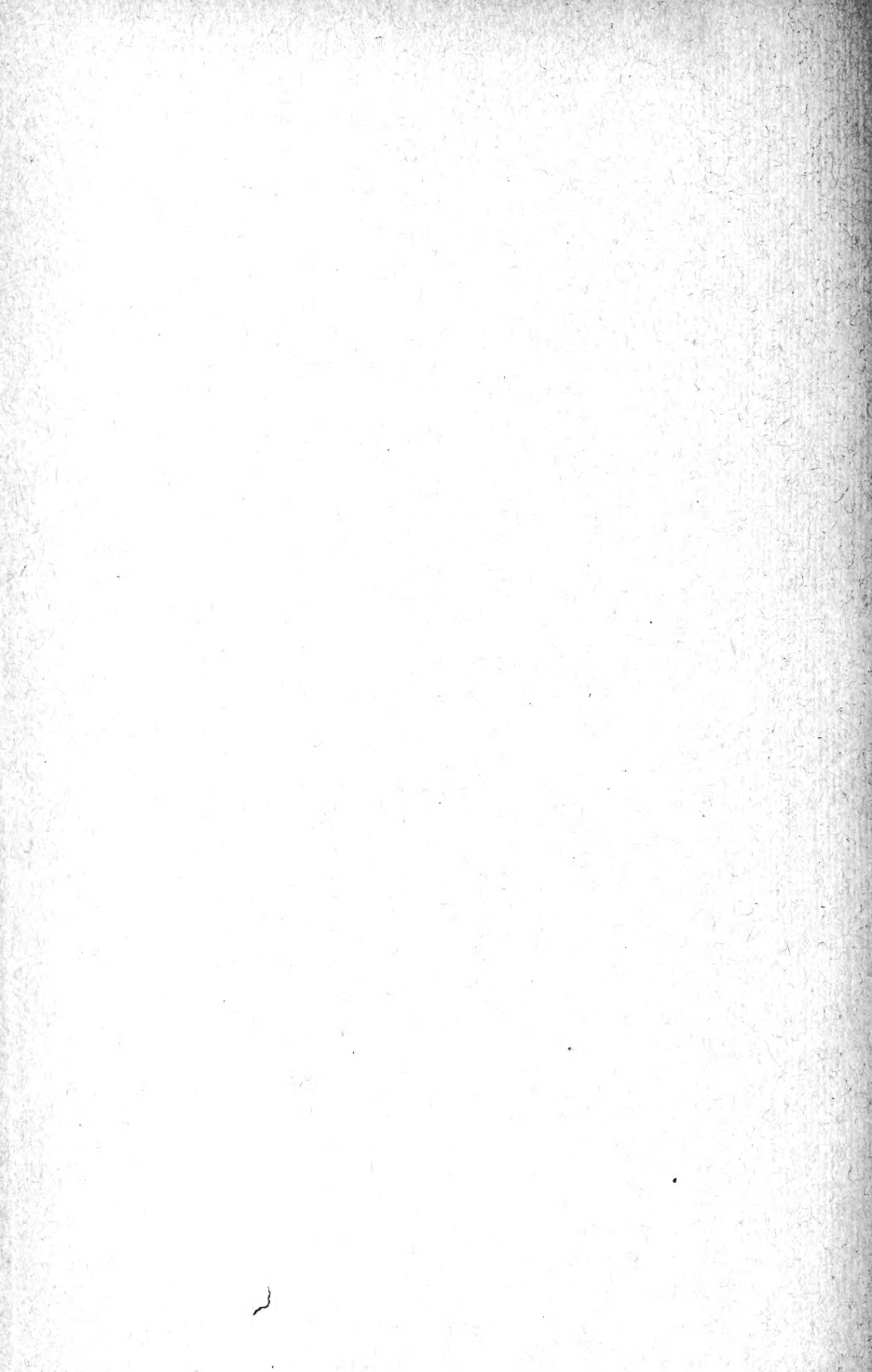
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